

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
NATIONAL TECHNICAL UNIVERSITY  
"KHARKIV POLYTECHNIC INSTITUTE"



ENGINEERING GRAPHICS

Методичні вказівки англійською мовою для  
аудиторної та самостійної роботи студентів  
технічних спеціальностей НТУ «ХПІ»

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Cherniavskyi A. , 2018

## ALBUM OF THE ASSIGNMENTS

*Table 1*

№ of the Assignments	Name of the Assignments	Formats of the Assignments	Balls
<b>STANDARDS</b>			
1	Album of the Assignments	A3	10
2	Geometric constructions of the Shaft and the Gasket	A4	10
<b>ORTHOGRAPHICAL PROJECTIONS OF A POINT, LINE AND PLANE</b>			
3	Positional and metric problems	A3	10
<b>SOLIDS</b>			
4	Solids and section (polyhedrons)	A3	10
5	Solids and sections (figures of revolution)	A3	10
6	Axonometric drawings	A4	10
<b>PROJECTIONS WITH ELEVATIONS</b>			
7	Projection of Topographical Surfaces	A4	10
<b>COMPUTER DRAWINGS</b>			
8	Geometric constructions of the Shaft and a Gasket	A4	10
9	Solids and section (polyhedrons)	A4	10
10	Solids and sections (figures of revolution)	A3	10

List of all assignments are represented in the Table 1.

**USDD** - Uniform system of design documentation; **GOST** – state standard specification

### 1. THE FORMATS.

Fill the Table2 according to GOST 2.301-68.

**Table 2**

FORMATS				
A0	A1	A2	A3	A4
841 × 1189				

### 2. SCALES.

Fill the Table3 according to GOST 2.302-68.




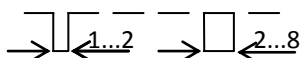
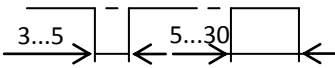

**Table 3**

Actual size	1 : 1;
The scales of reduction	1 : 2; 1 : 2,5;
The enlargement scales	2 : 1; 2,5 : 1;

### 3. TYPES OF LINES.

Fill the Table 4 according to GOST 2.303-68.

**Table 4**

Name	Image	Thickness of the line relative to the thickness of a solid main line
The solid main		S
The solid thin		S/3 ... S/2
The solid wavy		S/3 ... S/2
The dashed		S/3 ... S/2
Dash-dotted slim		S/3 ... S/2
The disconnected		S ... 1,5S

#### 4. FONT TYPES.

The Font Type B with a slope 75 ° is represented at Figure 1.1 according to GOST 2.304-81.

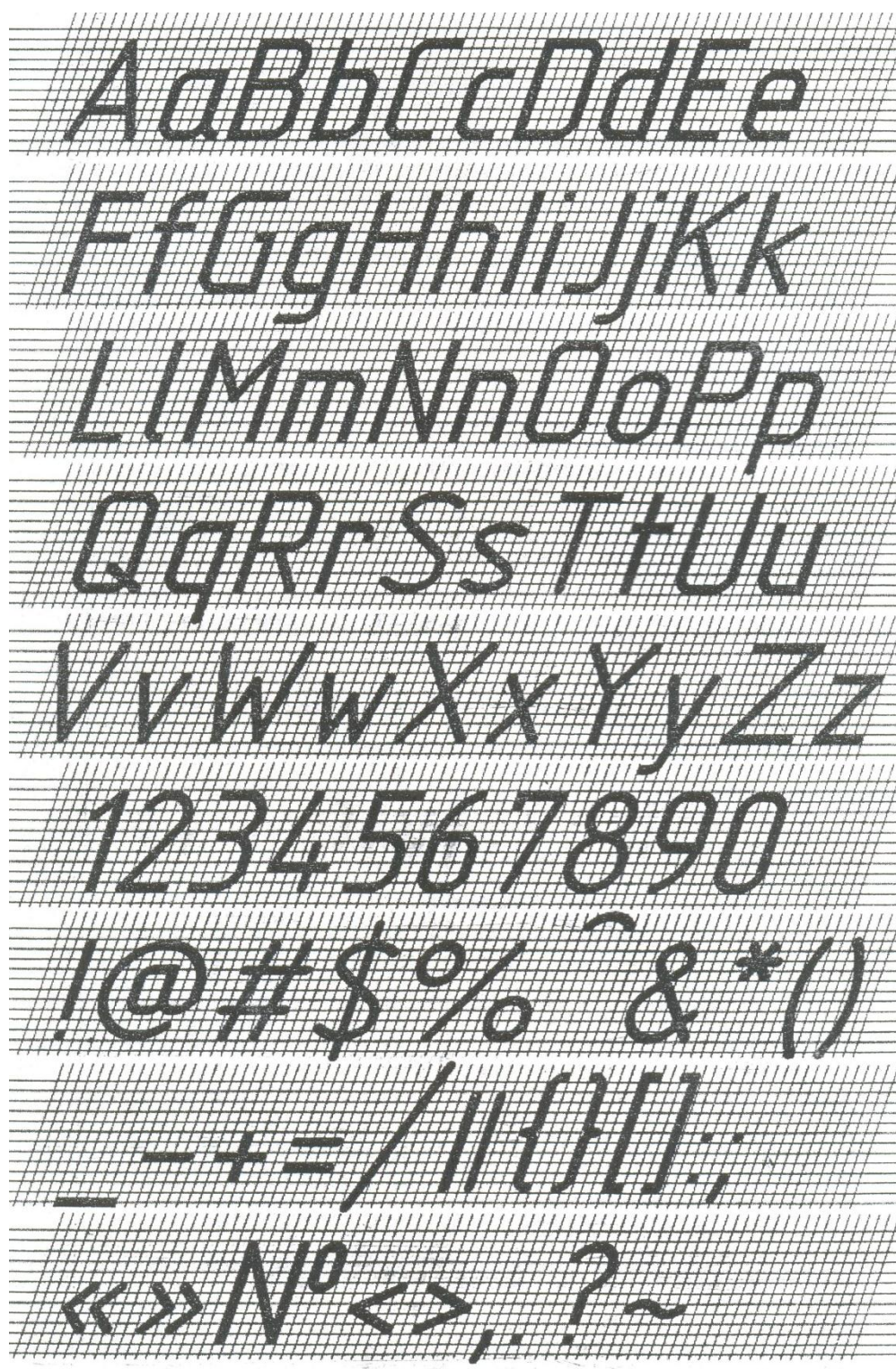


Fig. 1.1. The Font type B with a slope 75 °





## 5. GEOMETRIC CONSTRUCTIONS OF SHAFT AND GASKET.

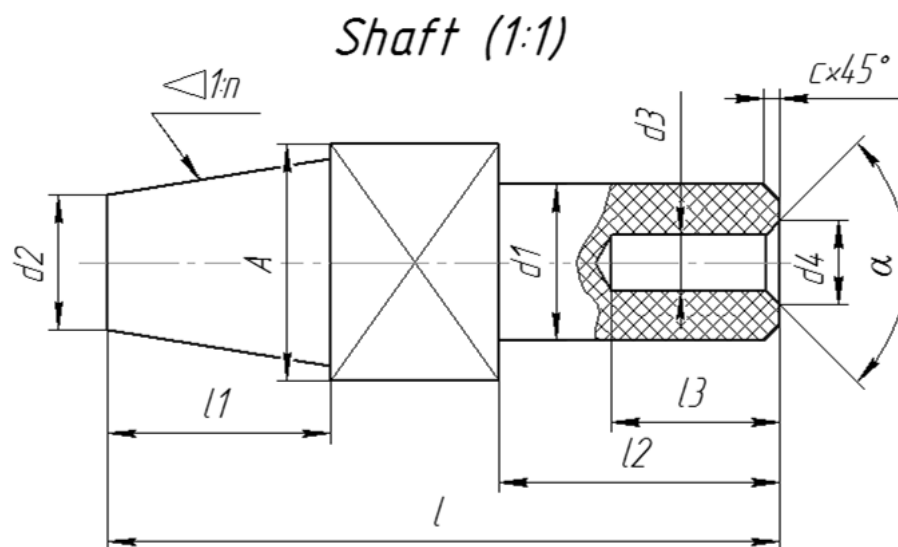


Fig. 1.4. The Shaft drawing

**Table 6**

option	A	d1	d2	d3	d4	L	l1	l2	l3	$\alpha$	c	n	scale
1,9	Ø40	30	20	8	15	110	30	55	25	60	2	3	1:1
2,10	□42	28	24	10	15	130	40	60	30	90	3	5	1:1
3,11	Ø84	56	48	20	30	260	80	120	60	60	6	5	1:2
4,12	Ø105	70	60	25	35	325	100	150	75	60	7,5	5	1:2,5
5,13	□80	60	40	16	30	220	60	110	50	90	4	3	1:2
6,14	□100	75	60	20	37,5	275	75	125	60	90	5	3	1:2,5
7,15	Ø160	120	80	32	60	440	120	220	100	60	8	3	1:4
8,16	□140	112	96	40	60	520	160	240	120	90	12	5	1:4

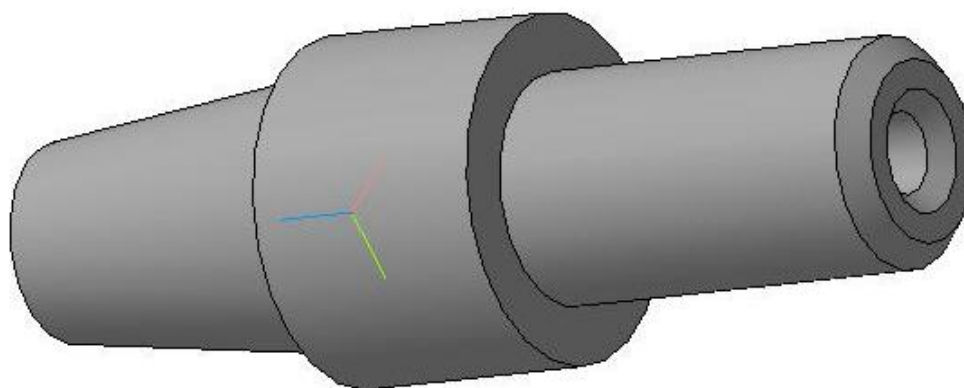


Fig. 1.5. The Shaft 3D model

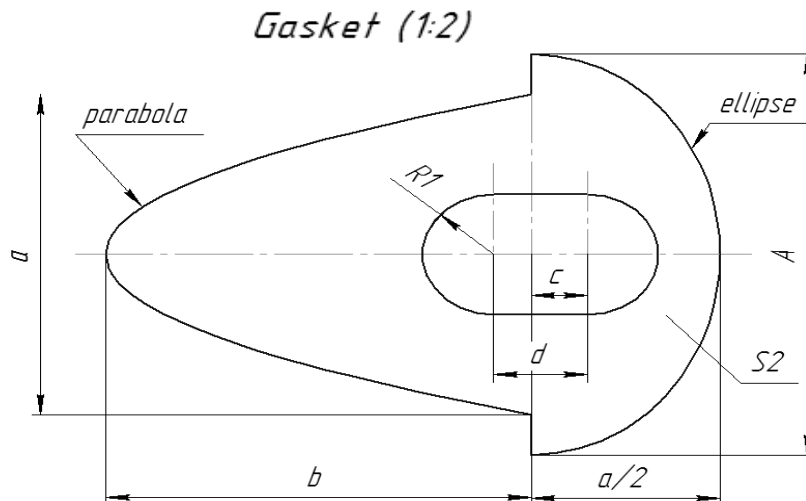


Fig. 1.6. The Gasket drawing

**Table 7**

Option	a	b	c	d	R1	A	scale
1,9	80	100	10	25	12	100	1:1
2,10	70	110	10	20	12	90	1:1
3,11	160	200	20	50	24	200	1:2
4,12	80	90	12	20	16	100	1:1
5,13	60	120	15	30	10	90	1:1
6,14	160	180	24	40	30	200	1:2
7,15	90	110	15	30	12	100	1:1
8,16	45	60	5	10	6	50	2:1

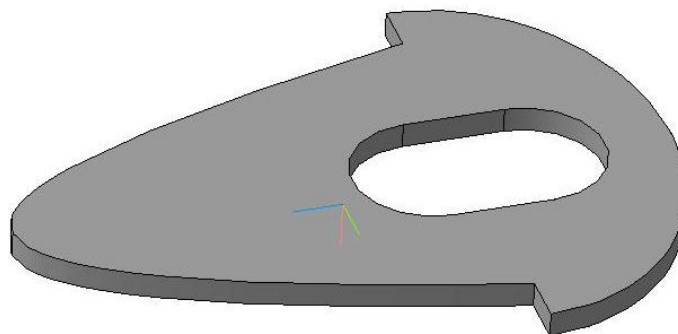


Fig. 1.7. The Gasket 3D model

### **HOMEWORK**

Make a drawing of a Shaft and a Gasket. Use all parameters from Table 6, 7 and Figures 1.4 - 1.7. The example of the drawing is represented in Annex 2.



**ORTHOGRAPHICAL PROJECTIONS OF A POINT**

Frontal plane of projections  $\pi_2$

Horizontal plane of projections  $\pi_1$

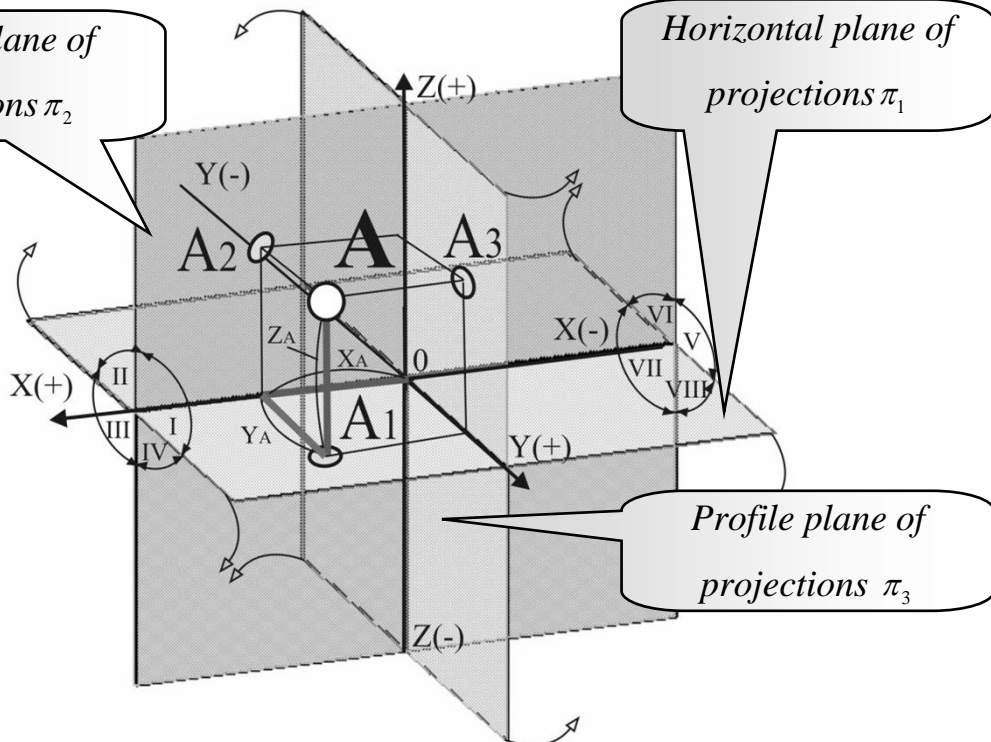


Fig. 2.1. The conditional and perspective drawing

Horizontal projector

Frontal projection of the point A

Profile projection of the point A

Vertical projector

Horizontal projection of the point A

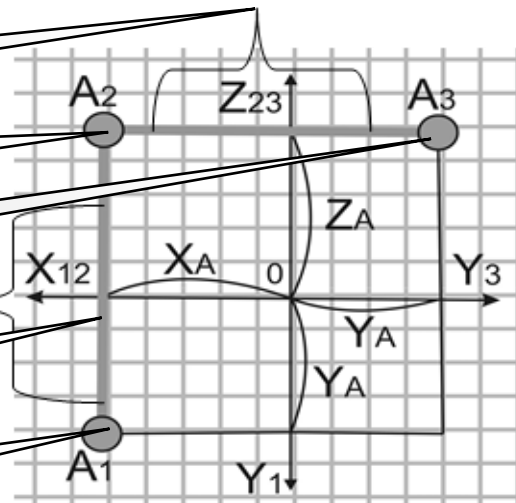


Fig. 2.2. Orthographic drawing (Monge's drawing)

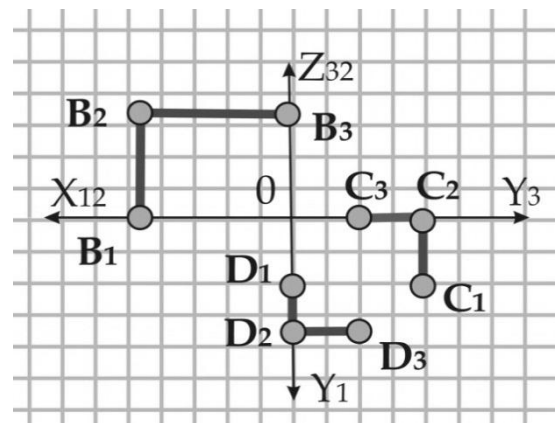
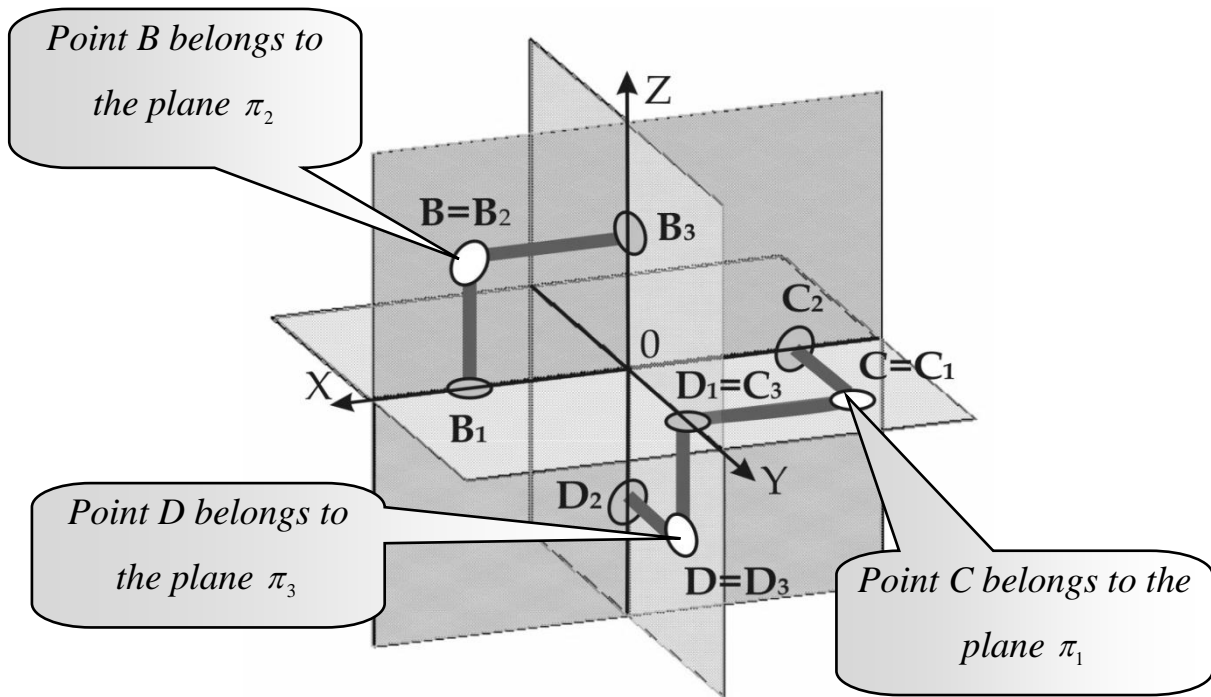


Fig. 2.3. Orthographic projection of the point



Monge Gaspard,  
french mathematician  
and geometer  
1746-1818



*Descriptive geometry as a science was established the end of XVIII century the great French geometer and engineer Gaspard Monge (1746-1818).*

*The first idea of orthogonal projection on the plane of spatial figures expressed long before the Monge in the XVI century German mathematician and artist Albrecht Dürer (1471-1528), who developed the method of orthogonal image conic sections and some spatial curves.*

*In 1637, the French geometer i philosopher Rene Descartes (1596-1650) created a method of coordinate i laid the foundations of analytical geometry and his compatriot, engineer and mathematician Dezah Girard (1593-1662) used this method to build a perspective coordinate projections and established theory axonometric projections.*



### Answer the following questions!

1. The projection of the point is \_\_\_\_\_ (Fig. 1.1)?

2. Write down the coordinates which determine frontal, horizontal and profile projection of a point  $A_1( \quad, \quad)$ ,  $A_2( \quad, \quad)$ ,  $A_3( \quad, \quad)$  (Fig. 1.2)?

3. In what case the point belongs to the plane  $\Pi_3$  \_\_\_\_\_,  $\Pi_1$  \_\_\_\_\_ and  $\Pi_2$  \_\_\_\_\_ ( Fig. 1.3)?

4. What *coordinates* determine the distance from the point to the frontal plane of projections \_\_\_\_\_ to the horizontal plane of projections \_\_\_\_\_, to the profile plane of projections \_\_\_\_\_?

5. In what case the point will be *equally spaced* from the planes of projections  $\Pi_1$  and  $\Pi_2$  \_\_\_\_\_?

6. In what case the points  $A$  and  $B$  will be located at the same distance from the plane  $\Pi_1$  \_\_\_\_\_?

### Problem 2.1

For given points:

1. Construct the orthographic drawing.

2. Determine location of the points with respect to the planes of projections (fill the table 8).

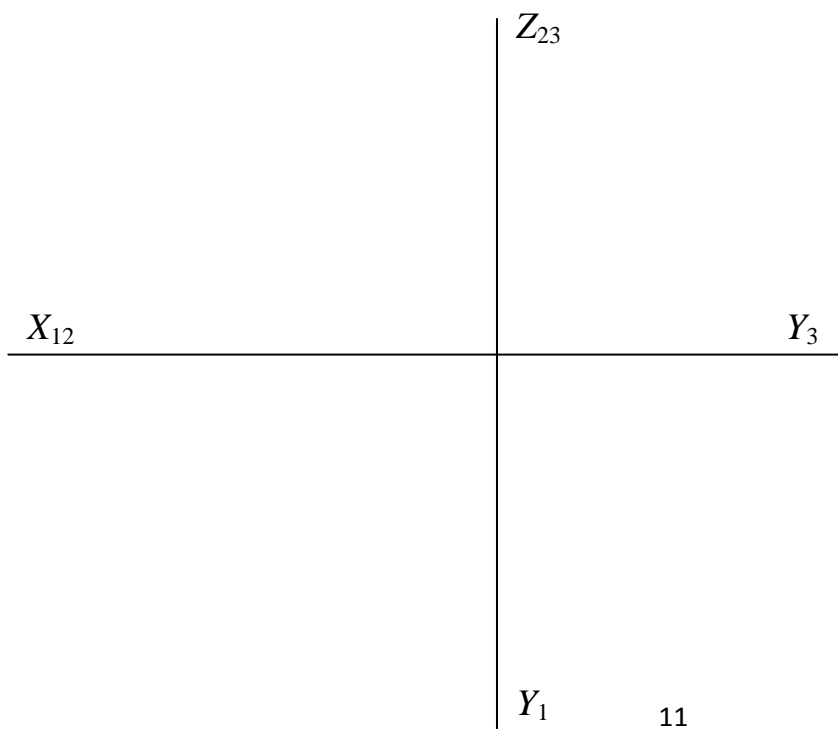
3. Indicate the planes of projection the point  $E$  are equally spaced from \_\_\_\_\_, the point  $G$  \_\_\_\_\_, the point  $K$  \_\_\_\_\_?

4. Find the point which is highest \_\_\_\_\_ and lowest \_\_\_\_\_.

5. Which of the points have the same distance to the profile plane of projections \_\_\_\_\_ to the frontal plane projections \_\_\_\_\_?

Table 8

Coordinates of points	Locations
$A(10, 20, 30)$	
$B(-30, 10, 20)$	
$C(0, -40, -10)$	
$D(-20, 0, -30)$	
$E(40, 40, 0)$	
$K(30, -20, 20)$	
$L(-15, -40, -10)$	
$G(25, 25, -25)$	





**Answer the following question!**

**1.** The *First Projection Law* tells that \_\_\_\_\_

\_\_\_\_\_

**2.** The *Second Projection Law* tells that \_\_\_\_\_

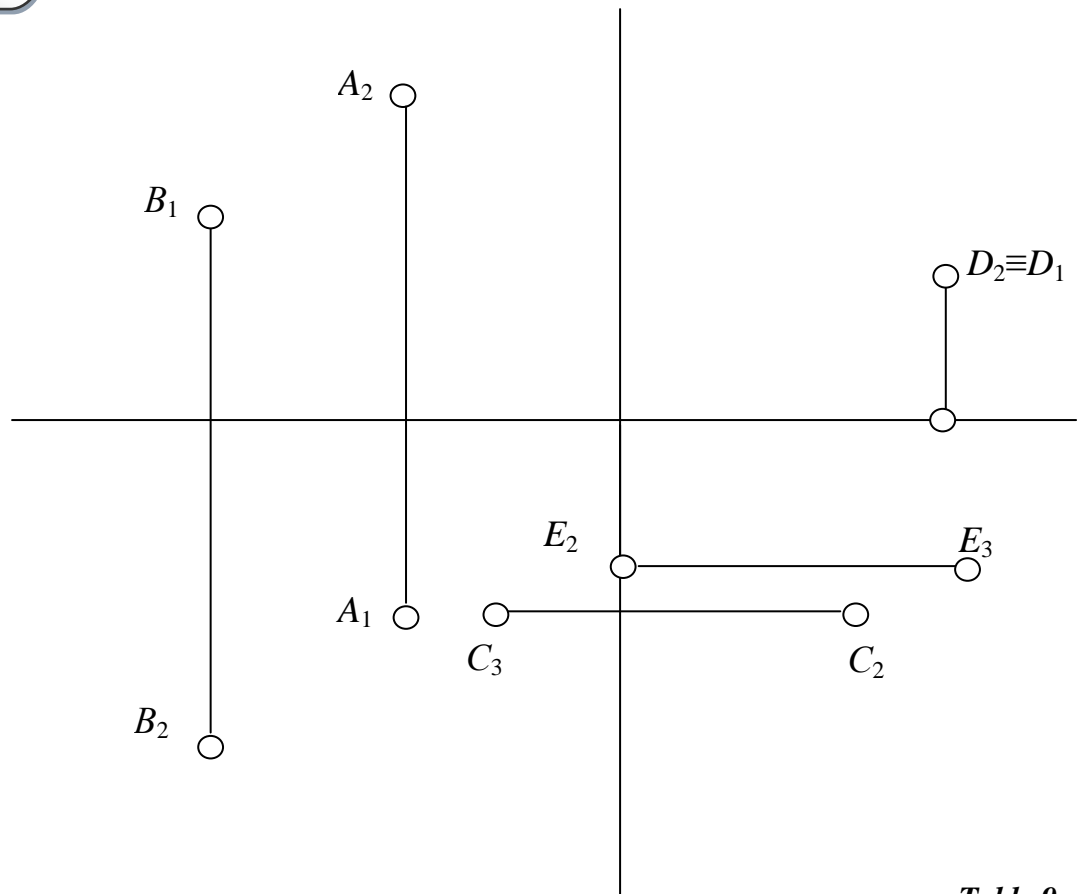
\_\_\_\_\_

**3.** The *Third Projection Law* tells that \_\_\_\_\_

\_\_\_\_\_

### Problem 2.2

**1.** Construct on the Orthographic drawings the Missing Projections of Points. **2.** Determine the Coordinates and Locations of each Point. Fill the Table 9.3. Identify points which are equally spaced from  $\Pi_1$ .



**Table 9**

Coordinates	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>X</i>					
<i>Y</i>					
<i>Z</i>					
Locations					

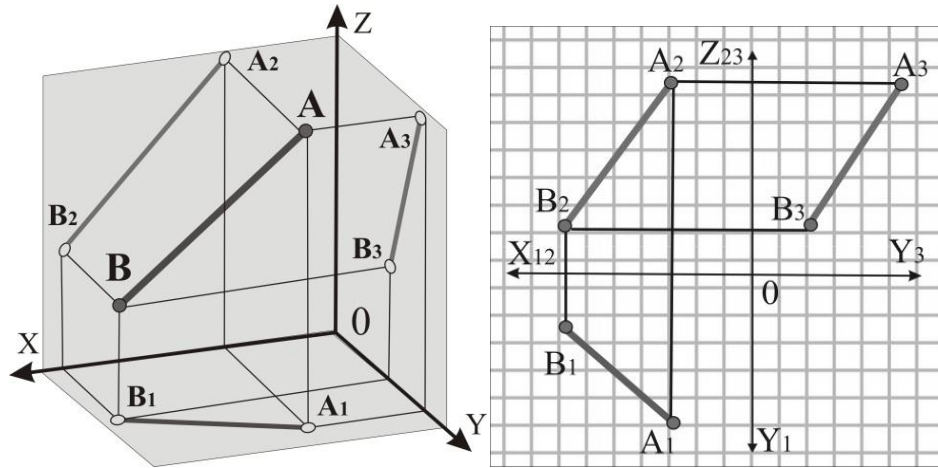


Fig.3.1. The Oblique line

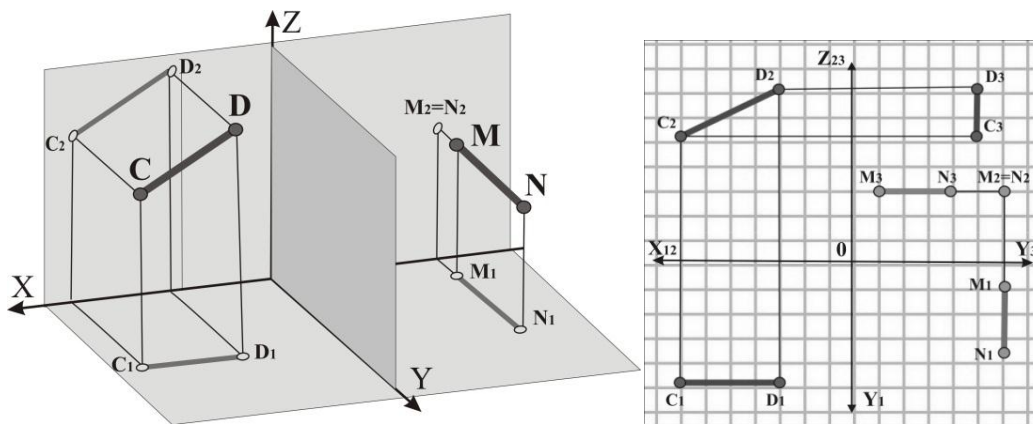


Fig.3.2. The frontal and the frontally projecting line

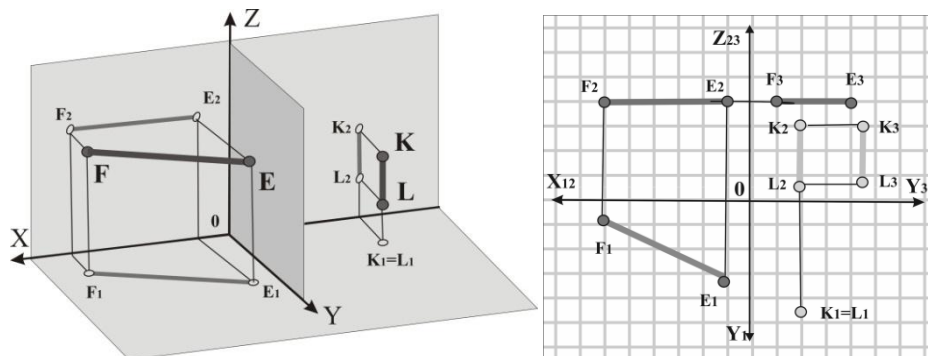


Fig.3.3. The horizontal and the horizontally projecting line



### Answer the following questions!

1. What location does the Oblique line have with respect to the planes of Projections?(Fig. 3.1)What location does the Oblique line have with respect to the coordinate axes( $\parallel$ ,  $\parallel$ ,  $\perp$ ,  $\perp$ )?

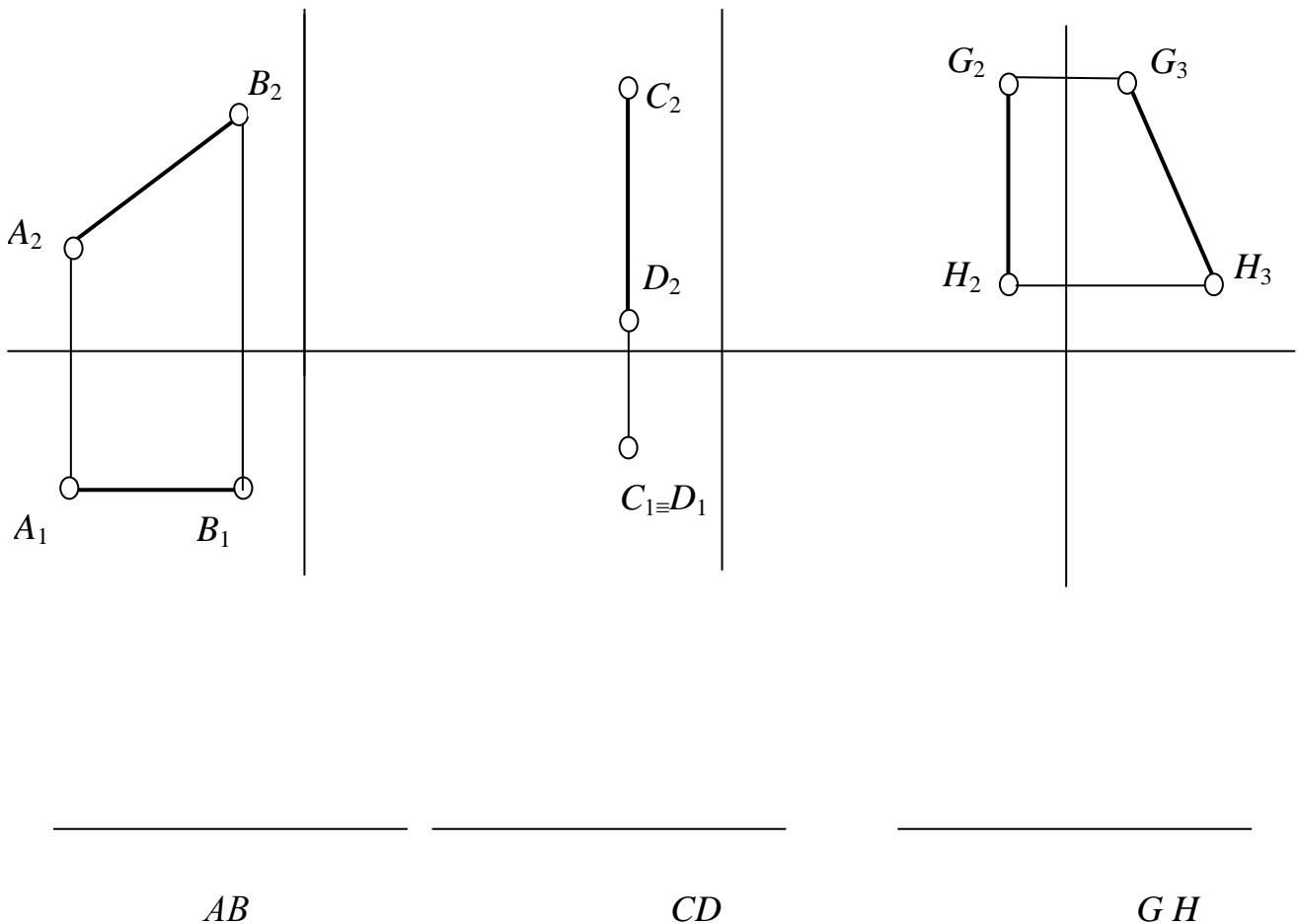
2. What are the frontal, horizontal and profile line (Fig. 3.2, 3.3)?What location does ( $\parallel$ ,  $\parallel$ ,  $\perp$ ,  $\perp$ ) the projections of frontal, horizontal and profile line have with respect to the coordinate axes:

- the horizontal:  $F_1E_1$ \_\_\_\_,  $F_2E_2$ \_\_\_\_,  $F_3E_3$ \_\_\_\_;
- the frontal:  $C_1D_1$ \_\_\_\_,  $C_2D_2$ \_\_\_\_,  $C_3D_3$ \_\_\_\_;
- the profile:  $K_1L_1$ \_\_\_\_,  $K_2L_2$ \_\_\_\_,  $K_3L_3$ \_\_\_\_?

3. What Type of the line projects into a point? (Fig. 3.2, 3.3)?

### Problem 3.1

1. Construct a missing projection of the line segments.
2. Identify the type of straight line with respect to the planes of projections.
3. Find the true size and angles ( $\alpha$ ,  $\beta$ ,  $\gamma$ ) of each line?



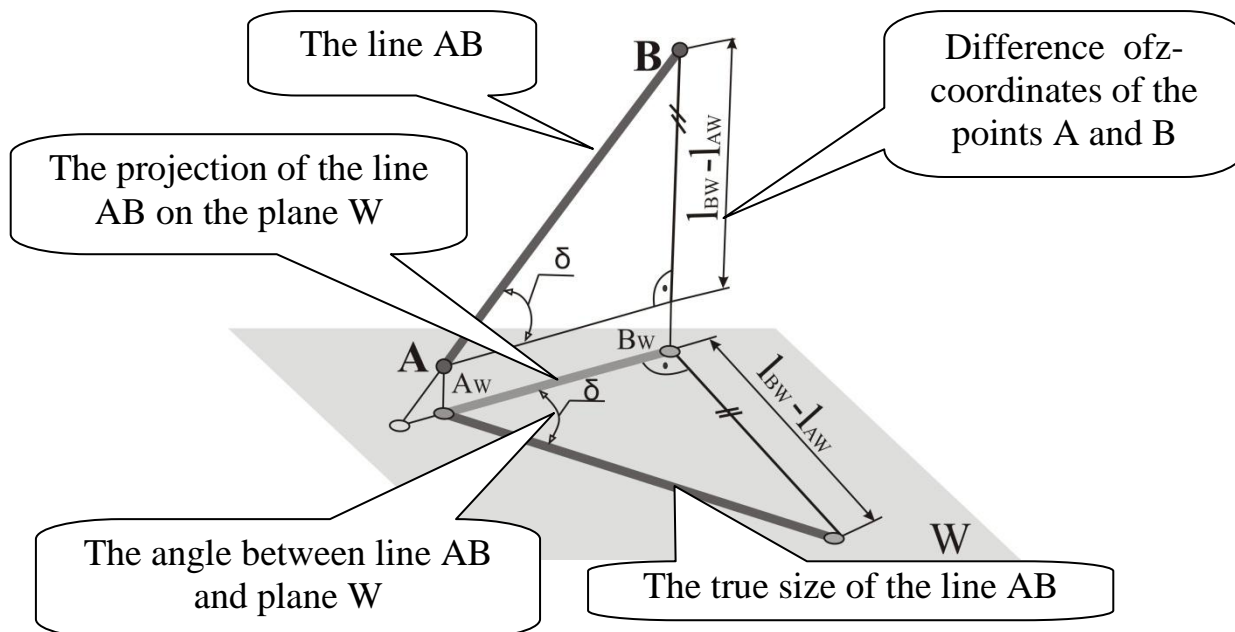


Fig. 3.4. The True size of Oblique line  
(The rule of the right triangle)



### Answer the following questions!

1. How to determine the *true size* of the Oblique line and angles between line and planes of projections on the orthographic drawings (Fig. 3.4)?

2. What is a trace of the line?

How many traces does a line have (Fig. 3.5, 3.6):

- the Oblique line \_\_\_\_\_;
- the line *parallel* to the plane of projection \_\_\_\_\_;
- the line *perpendicular* to the plane of projections \_\_\_\_\_?

### Problem 3.3

Construct the missing projection of the line AB and determine its true size and angles ( $\alpha$ ,  $\beta$ ,  $\gamma$ ). Fill the table 10.

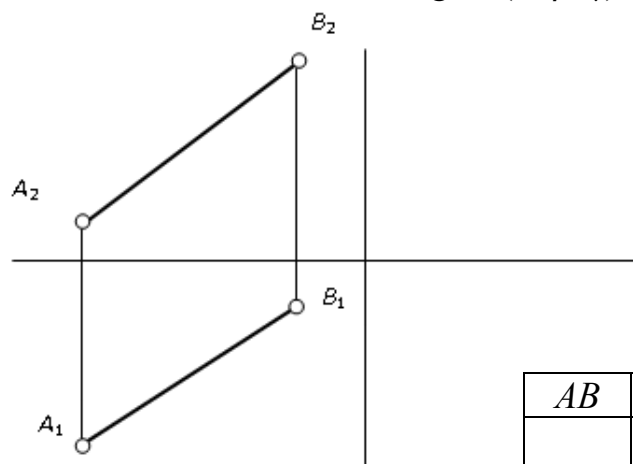


Table 10

AB	$\alpha$	$\beta$	$\gamma$



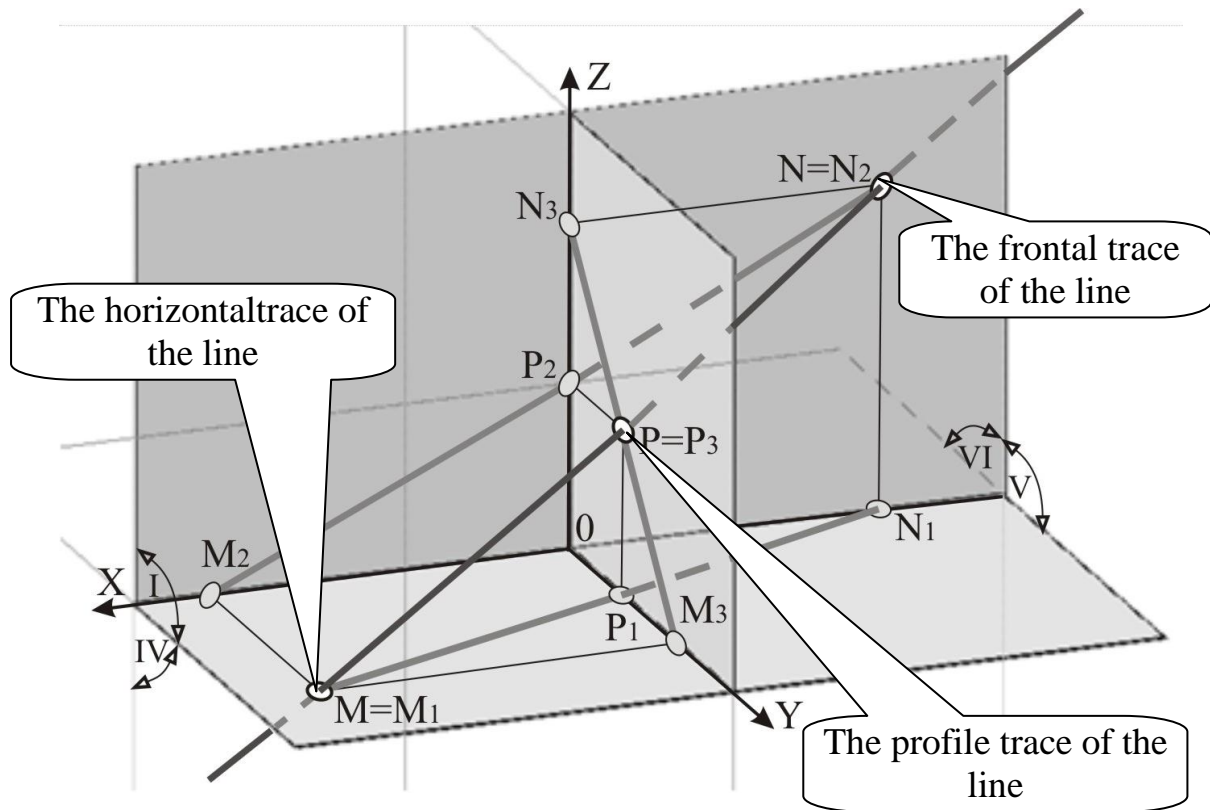


Fig. 3.5. Traces of the line

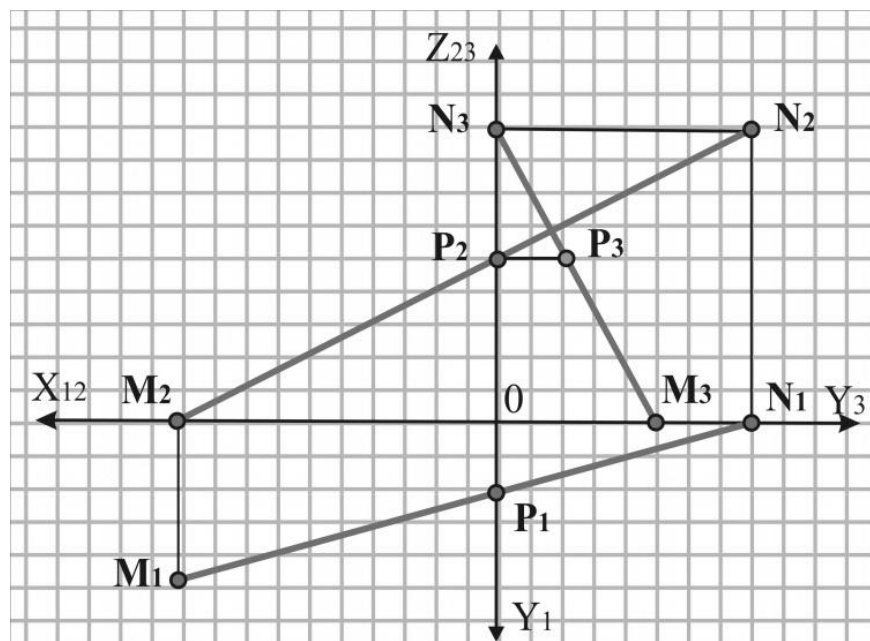


Fig. 3.6. Orthographic drawing of a Line

# 4 ORTHOGRAPHICAL PROJECTIONS OF A PLANE

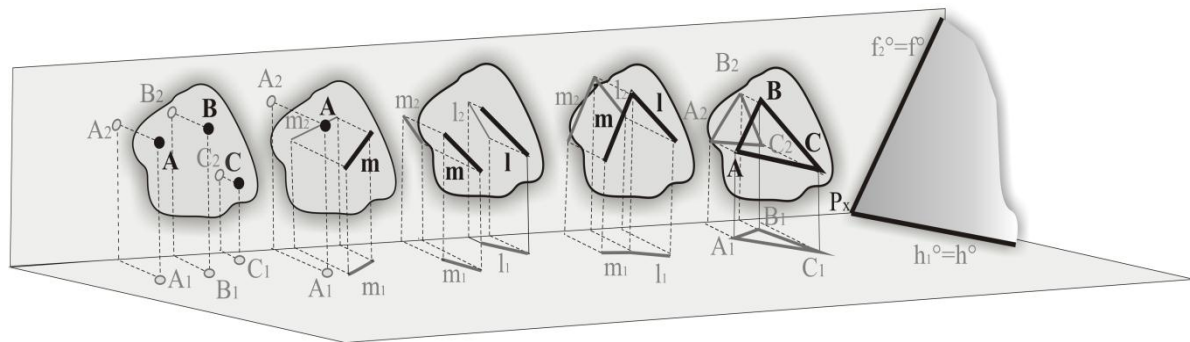


Fig. 4.1. Representation of the planes

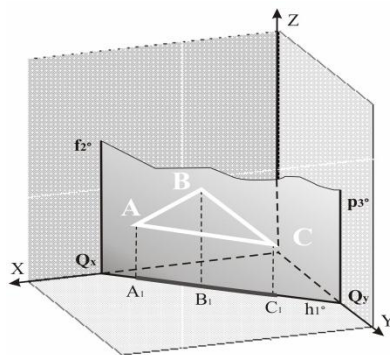


Fig. 4.2. Horizontally projecting plane

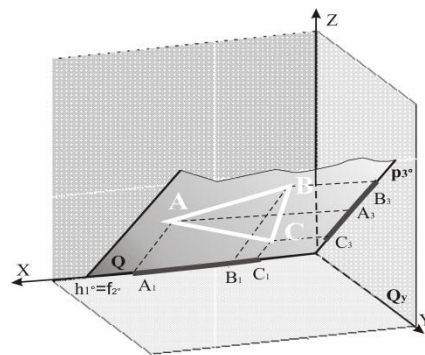


Fig. 4.3. Axial plane

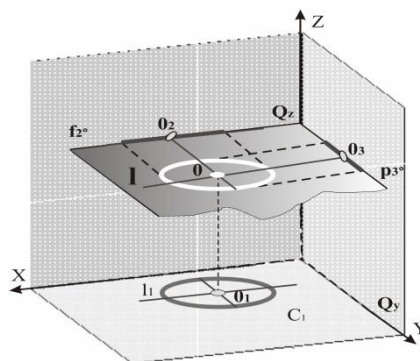


Fig. 4.4. The horizontal plane



**Answer the following question!**

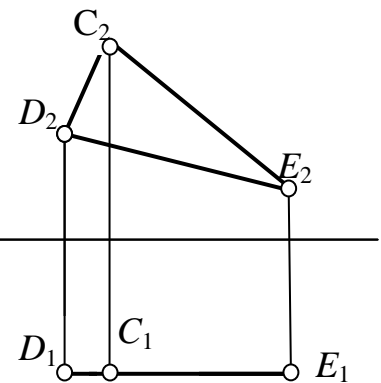
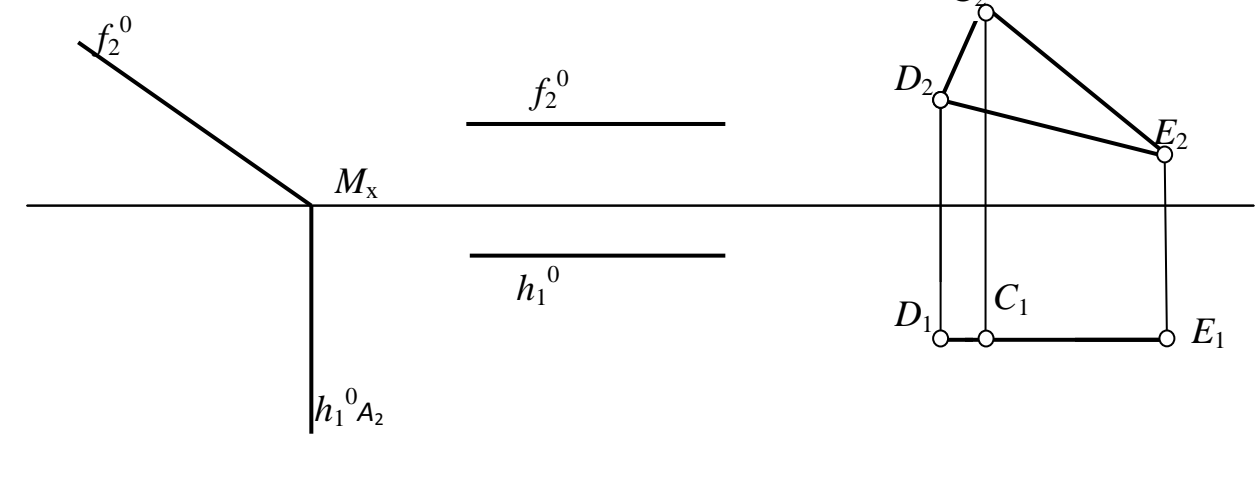
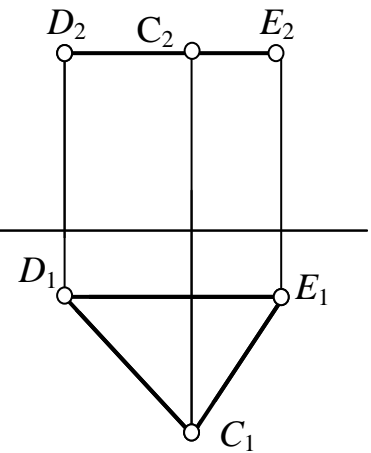
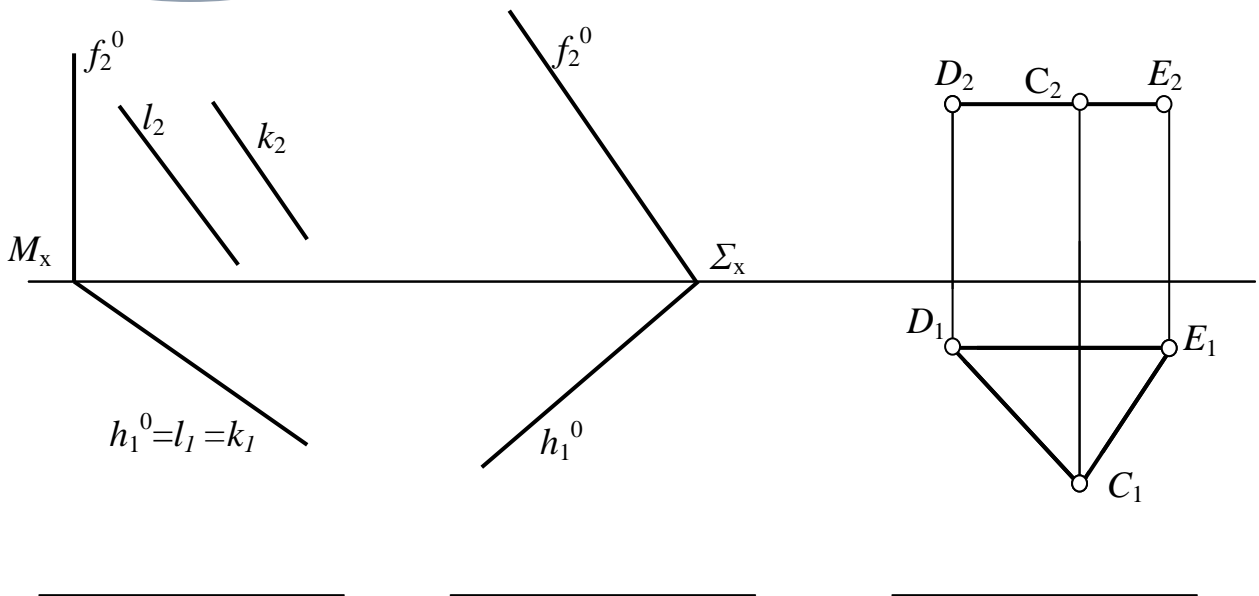
1. What location does the Oblique plane have with respect to the planes of Projections (Fig. 4.1)?

2. What Type of plane parallel to the planes of Projections (Fig. 4.4)? What property does it have?

3. In what case does the point belong to the plane? In which case does the line belong to the plane?



Determine location of each plane with respect to planes of Projections?



**Table 12**

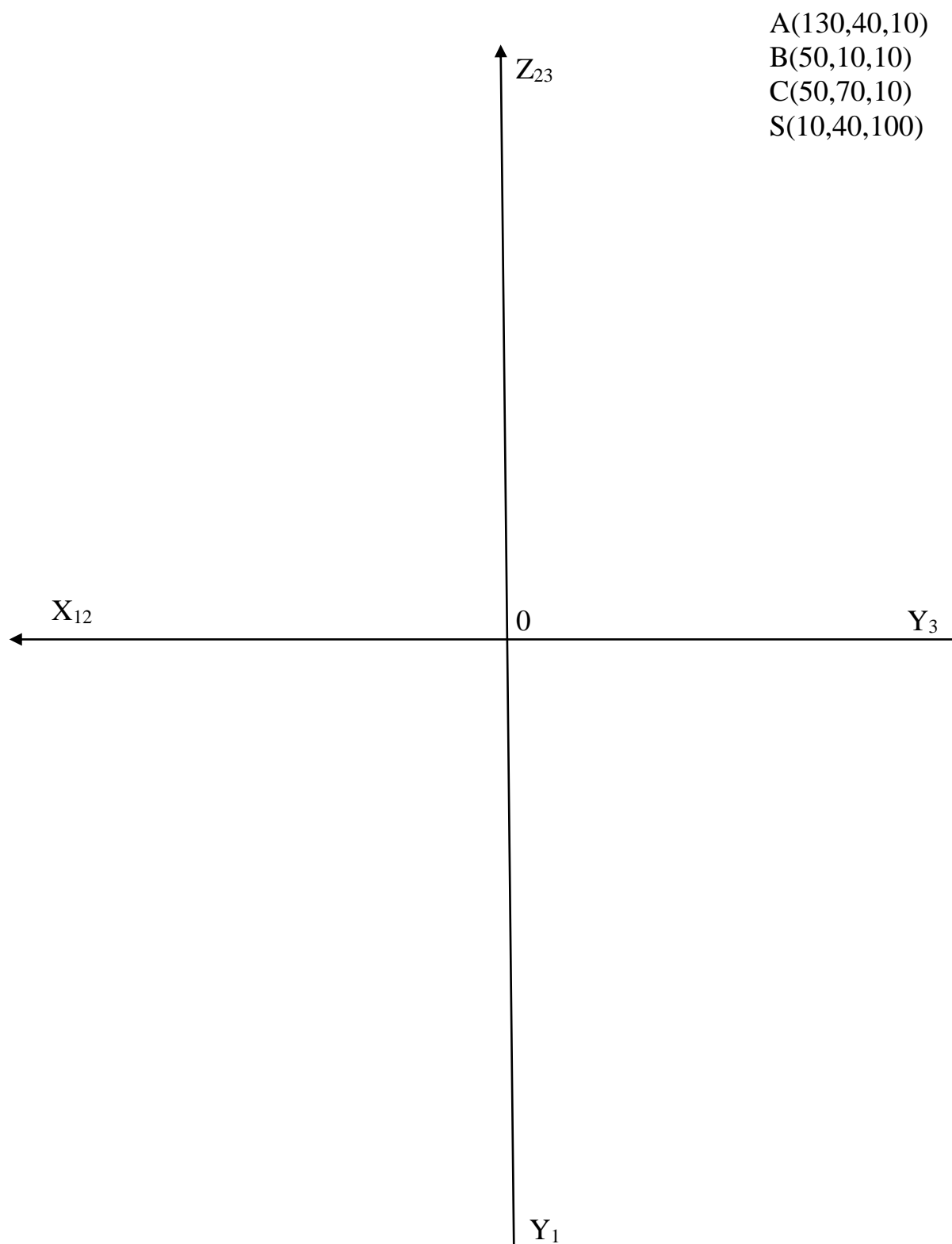
Variant	A(X,Y,Z)	B(X,Y,Z)	C(X,Y,Z)	S(X,Y,Z)
1	120,10,10	120,70,10	20,40,10	120,40,100
2	120,70,10	10,70,10	10,10,10	10,70,100
3	65,10,10	120,70,10	10,70,10	65,40,100
4	70,10,10	120,70,10	15,70,10	40,70,100
5	15,65,10	105,10,10	105,55,10	15,65,100
6	15,10,10	15,70,10	115,40,10	115,40,100
7	110,40,10	20,70,10	20,10,10	20,40,100
8	110,70,10	90,10,10	20,70,10	90,40,100
9	130,40,10	50,10,10	50,70,10	10,40,100
10	40,70,10	120,40,10	70,10,10	10,40,100
11	20,70,10	110,70,10	70,10,10	20,70,100
12	110,70,10	110,10,10	10,10,10	60,40,100
13	10,10,10	10,10,10	60,70,10	60,10,100
14	100,60,10	100,10,10	10,10,10	10,60,100
15	110,10,10	40,10,10	40,60,10	10,10,100
16	110,10,10	10,10,10	60,70,10	60,40,100
17	120,10,10	120,70,10	10,30,10	120,30,100
18	110,70,10	15,70,10	15,10,10	15,70,105
19	70,10,10	130,70,10	10,70,10	85,50,100
20	120,65,10	20,65,10	70,10,10	95,65,100
21	100,65,10	100,10,10	20,65,10	20,65,100
22	115,30,10	15,10,10	5,70,10	115,30,100
23	20,70,10	20,10,10	100,50,10	20,50,100
24	15,70,10	110,70,10	50,10,10	50,40,100
25	40,70,10	120,40,10	40,10,10	10,40,100
26	80,10,10	40,70,10	115,40,10	10,40,100
27	40,10,10	15,70,10	100,70,10	15,70,100
28	110,10,10	10,10,10	110,70,10	35,25,100
29	65,70,10	115,10,10	5,10,10	65,70,100
30	15,10,10	100,60,10	100,10,10	15,60,100
31	120,10,10	120,70,10	20,40,10	120,40,100
32	120,70,10	10,70,10	10,10,10	10,70,100
33	65,10,10	120,70,10	10,70,10	65,40,100
34	70,10,10	120,70,10	15,70,10	40,70,100
35	15,65,10	105,10,10	105,55,10	15,65,100
36	15,10,10	15,70,10	115,40,10	115,40,100
37	110,40,10	20,70,10	20,10,10	20,40,100
38	110,70,10	90,10,10	20,70,10	90,40,100
39	130,40,10	50,10,10	50,70,10	10,40,100
40	120,10,10	120,70,10	20,40,10	120,40,100

**Task 4.1**

1. Construct three projections of the base of a pyramid according to the given coordinates of points A, B, C and join their projections of the same name.
2. Using the given coordinates of the point S construct three projections of the vertex S and join them with the vertexes of the base of pyramid be ribs SA, SB, SC.
3. Analyze position of the straight lines (ribs and sides of the base of the pyramid) in the space. For the straight lines of general position determine the life size with the method of the right-angled triangle; as to straight lines of the particular position, their length is determined and indicated on the certain plane of projection. The results are put down into the table.
4. Determine the position of the planes (sides and base of the pyramid) in the space by way of analysis of location of their projections, and fill into the table.
5. Construct the side development of the pyramid with the method of Triangle, conventionally cutting it through one of the ribs; then add the plane of the triangle ABC to any side of the base.

**Table 11**

Lines					
AS	BS	CS	AB	BC	AC
Planes					
ABC	SAB	SBC	SAC		



### **HOMEWORK**

Construct on the drawing paper A3 projection of points, lines and planes accordance with coordinates from the table 12. The Example of the task 3 «Orthographical projections of a point, line and plane » is presented in Annex 3.



**Test your knowledge! (The Example Card of the Test Control)**

**Analyze Fig. 1 and answer the questions 1-3.**

1. What Octant The Point 1 is located in?
2. Which of the points belongs to the horizontal plane of projections?
3. What Plane of Projection The Point 3 is equally spaced from?

**Analyze Fig. 2 and answer the questions 4-6.**

4. What segment of the line AG is parallel to horizontal plane of projections?
5. What segment of the line AG is perpendicular to the Vertical plane of Projection?
6. Which of Points is in front of Line AG?

**Analyze Fig. 3 and answer the questions 7-9.**

7. What is the name of horizontal projecting plane?
8. What is the name of Oblique plane?
9. What is the name of plane of horizontal level?

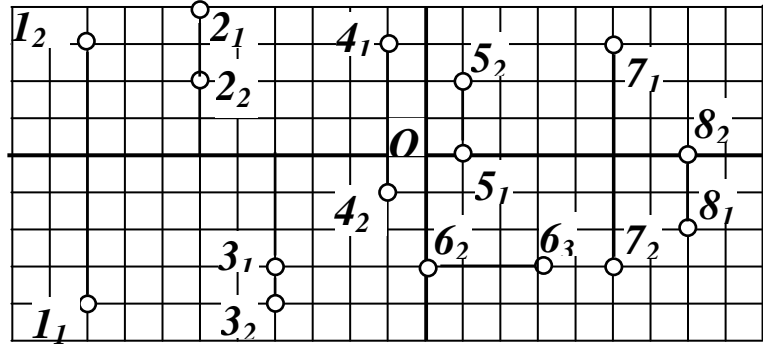


Fig. 1

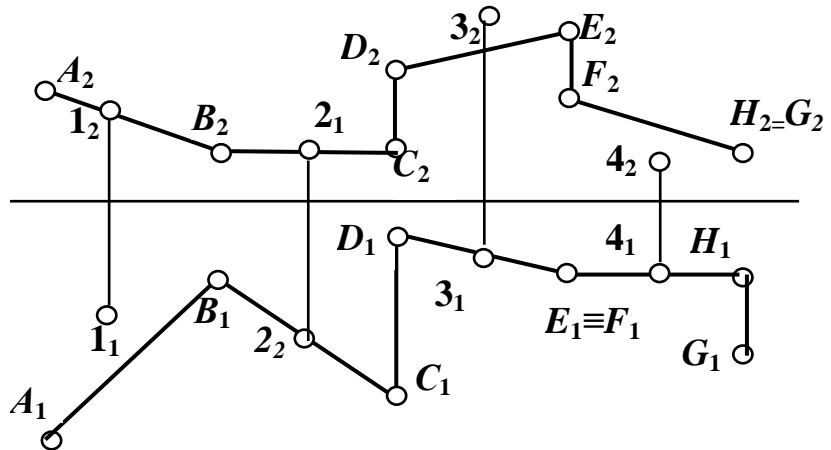


Fig. 2

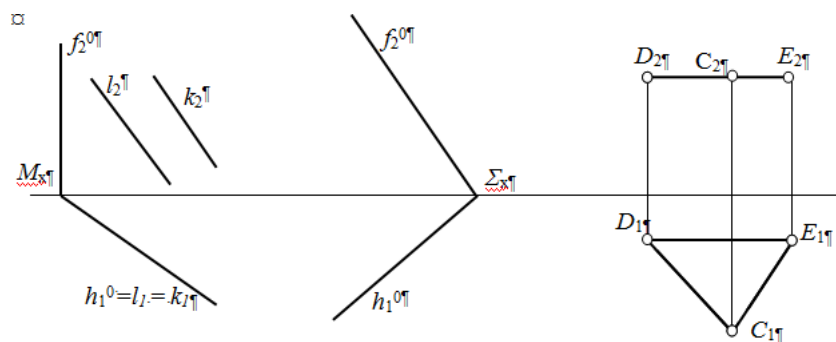


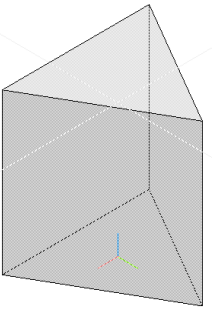
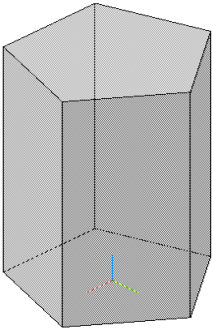
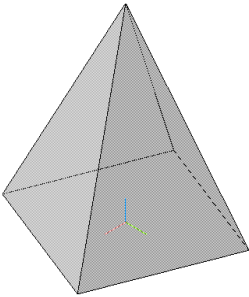
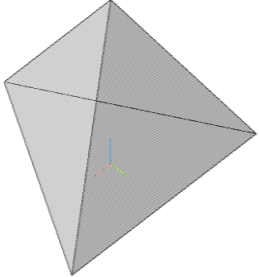
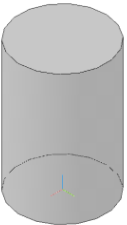
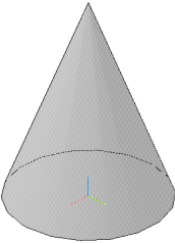
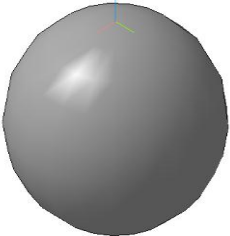
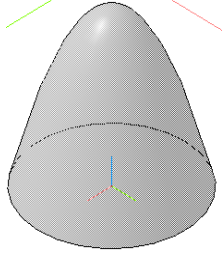
Fig. 3

**Finde Theanswers on the Page 44**





Table 13

<i>Polyhedrons</i>			
<i>Triangular prism</i>	<i>Pentagonal prism</i>	<i>Quadrangular pyramid</i>	<i>Triangular pyramid</i>
			
<i>Figures of revolution</i>			
<i>Cylinder</i>	<i>Cone</i>	<i>Sphere</i>	<i>Paraboloid of revolution</i>
			



### Answer the following question!

1. Give examples of using of surfaces (tabl. 13) in the industry?

2. In which case the point belongs to the Solid?
3. How to find missing projections of a point which belongs to the surfaces (cone, sphere, pyramid)?

### Problem 5.1

For given solids construct profile projections. Construct missing projections of a point, which belongs to the Solid.

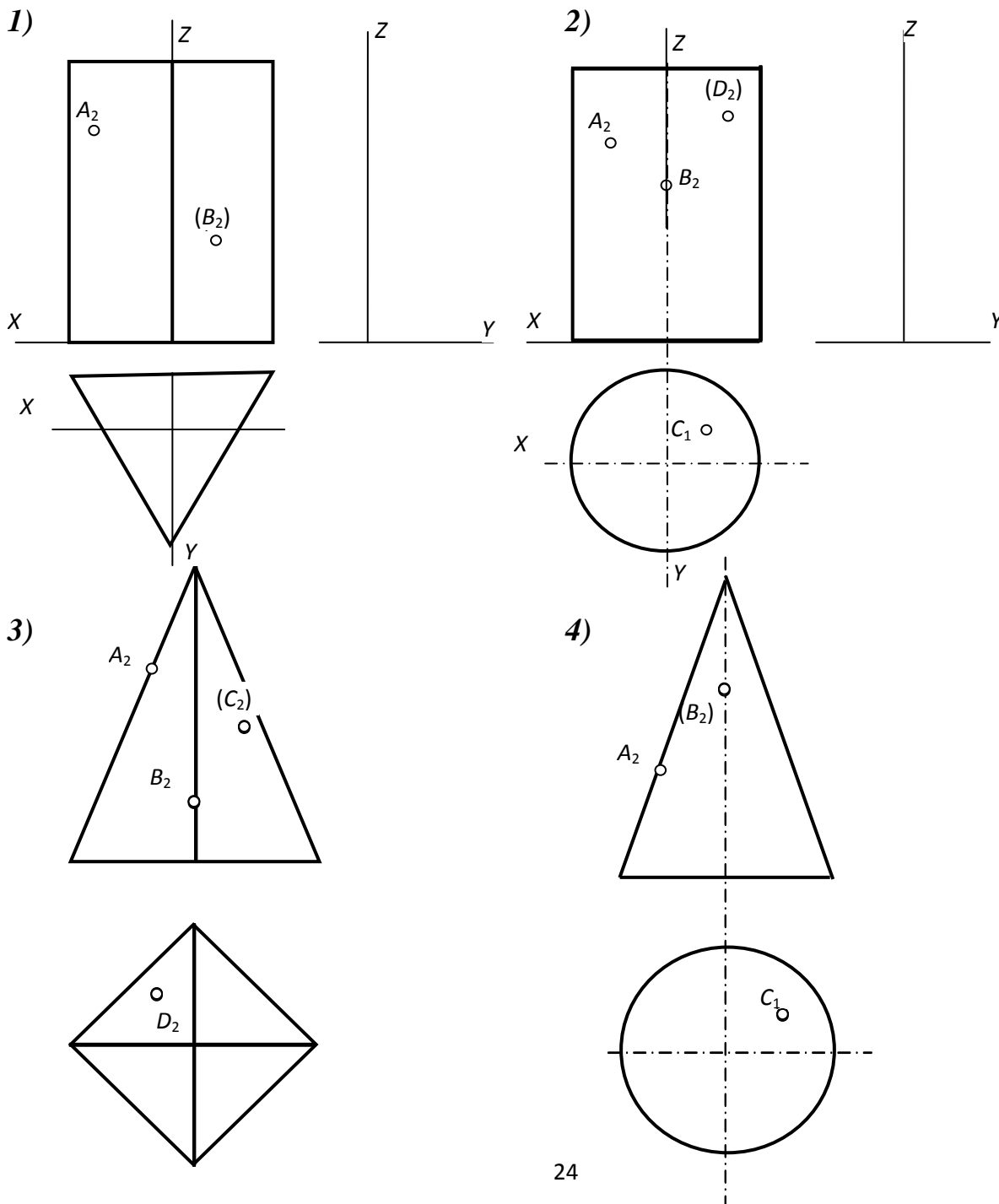
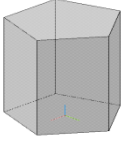
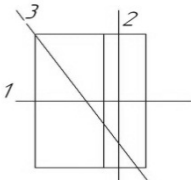
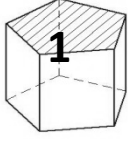
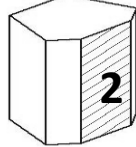
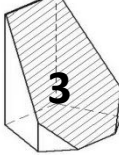
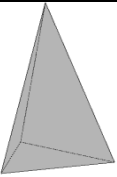
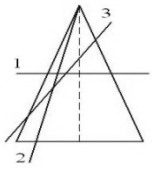
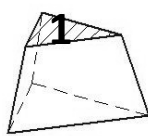
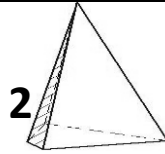
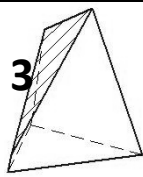

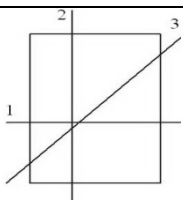
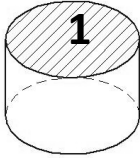
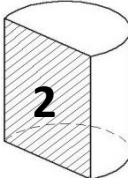

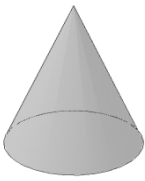
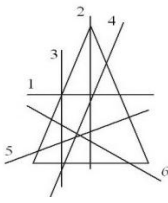
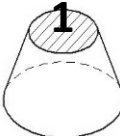
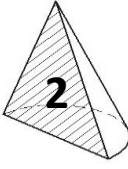

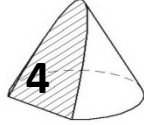




Table 14

<i>Section of Prism</i>				
<i>Sections of Prism are polygons</i>				
				
<i>Section of Pyramid</i>				
<i>Sections of Pyramid are Polygons</i>				
				
<i>Sections of Cylinder</i>				
<i>Types of cylinder sections</i>		<i>Circle</i>	<i>Rectangle</i>	<i>Ellipse</i>
				
<i>Section of Cone</i>				
<i>Types of cone sections</i>		<i>Circle</i>	<i>Triangle</i>	
				
<i>Hyperbole</i>	<i>Parabola</i>	<i>Ellipse</i>	<i>Part of ellipse</i>	
				



## Answer the following question!

1. What figures are formed by the cross-sectional of faced surfaces? As they are based (see Table 14)?

2. Types of cylinder sections are:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

3. What figure is formed in the sections of sphere? \_\_\_\_\_.

4. What direction should have a cutting plane of the next cone section:

ellipse \_\_\_\_\_;

part of ellipse \_\_\_\_\_;

parabola \_\_\_\_\_;

hyperbola \_\_\_\_\_;

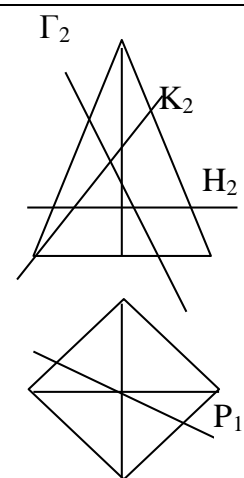
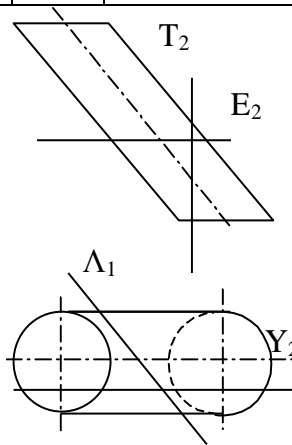
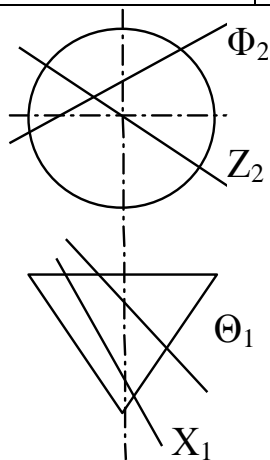
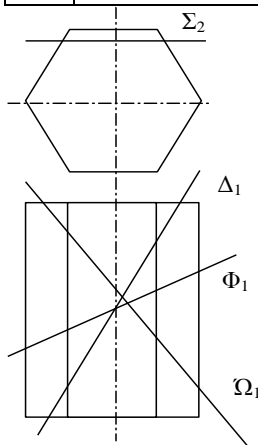
triangle \_\_\_\_\_;

circle \_\_\_\_\_?

## Speaking exercise 5.1

Determine the Form of the Each Solids sections.

1	circle	9	isosceles triangle
2	ellipse	10	octagon
3	square	11	heptagon
4	rectangle	12	equilateral triangle
5	part of the ellipse (more than half)	13	part of the ellipse (less than half)
6	quadrangle	14	parallelogram
7	pentagon	15	parabola
8	hexagon	16	hyperbole

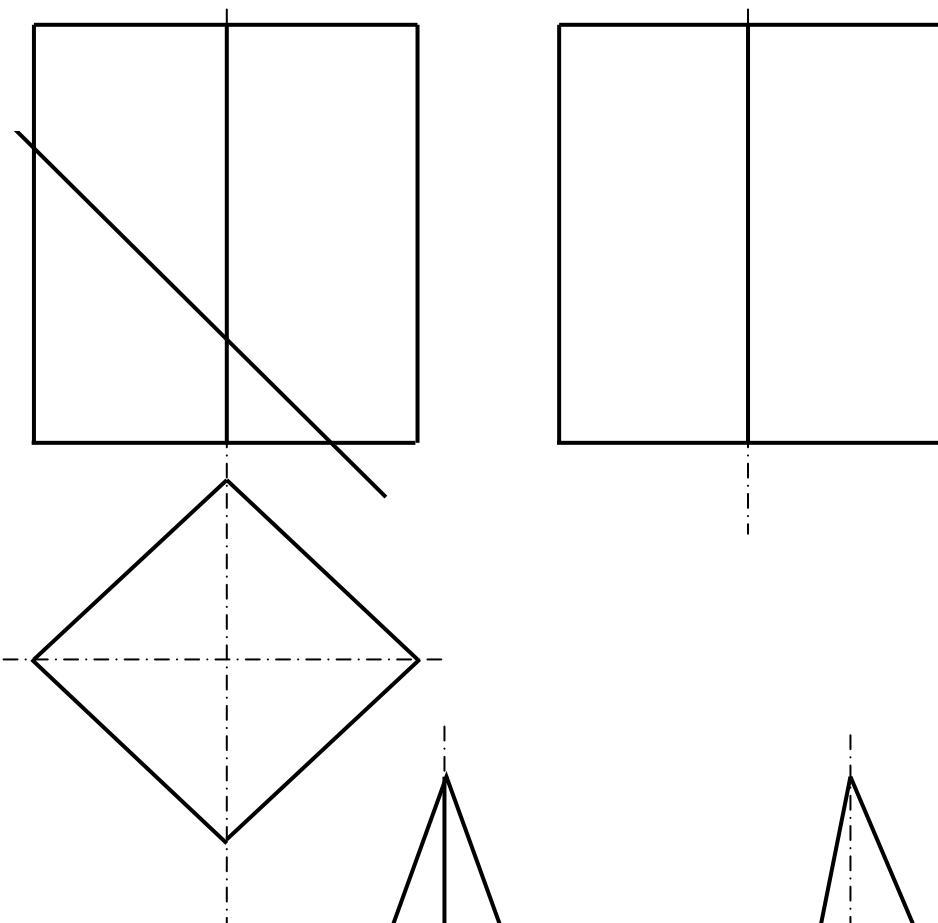


## Task 5.2

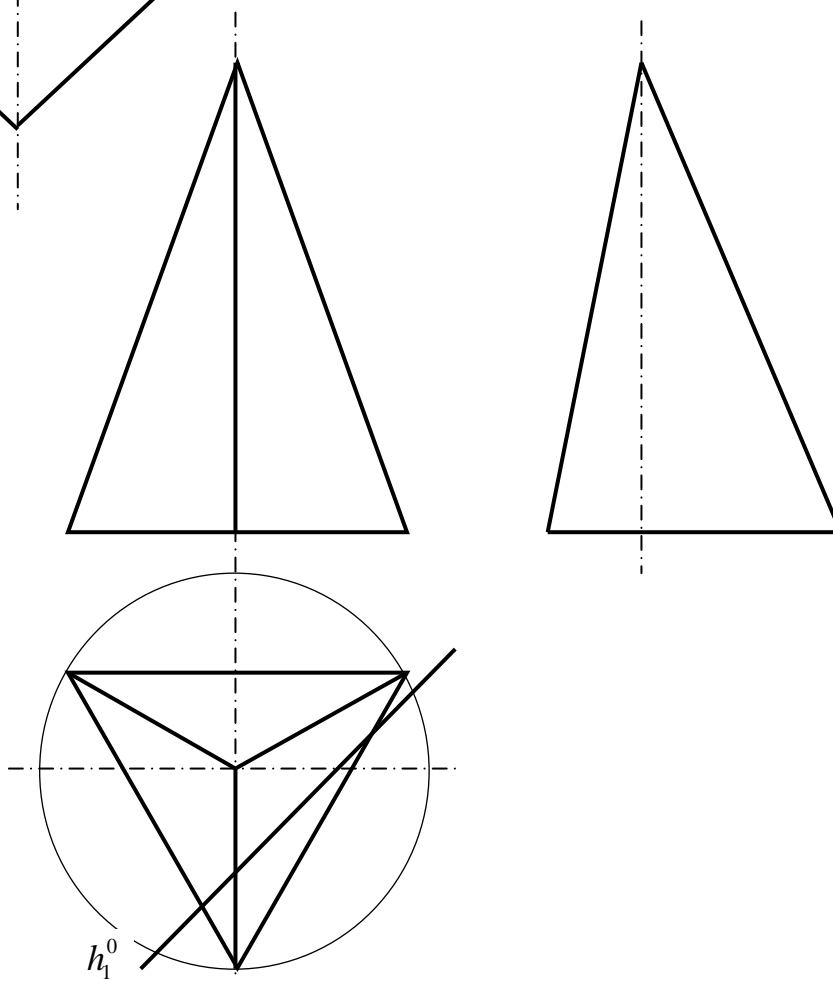
Construct three projections and find the true size of the sections of the given geometrical bodies by the projecting planes.

1)

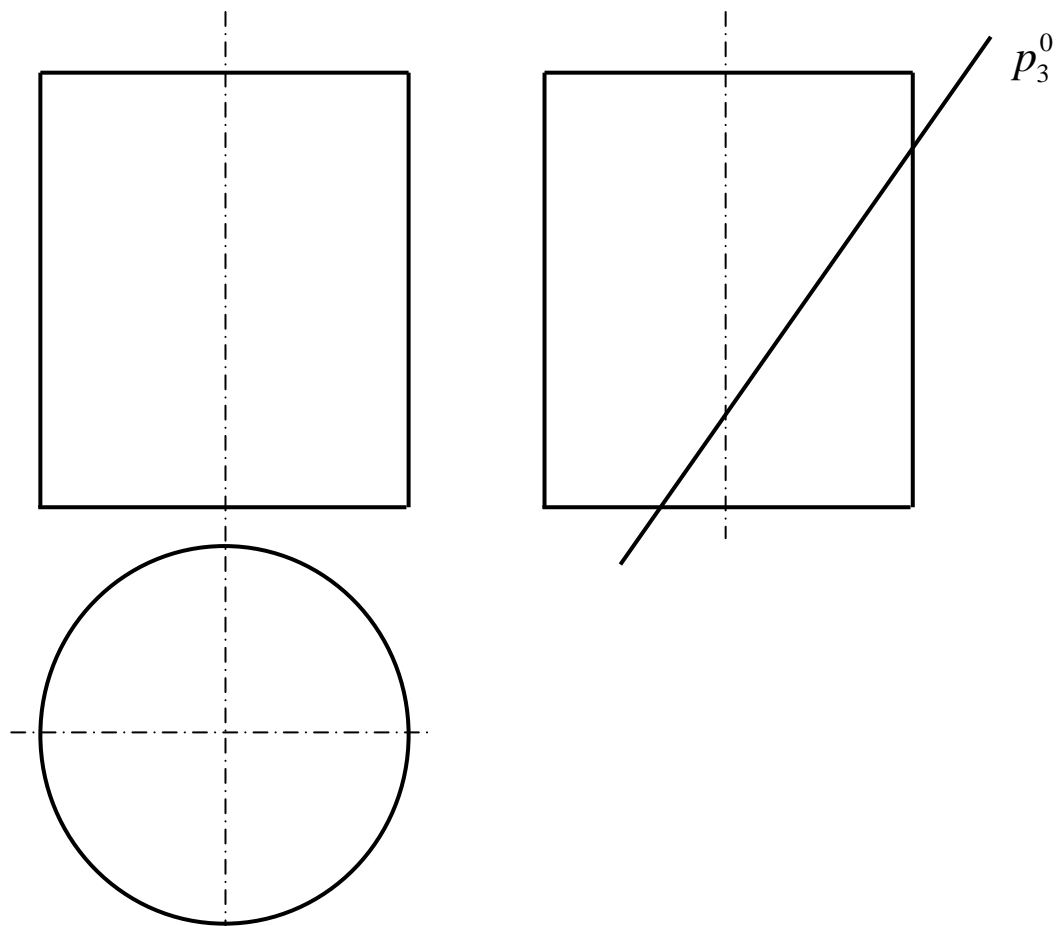
$f_2^0$



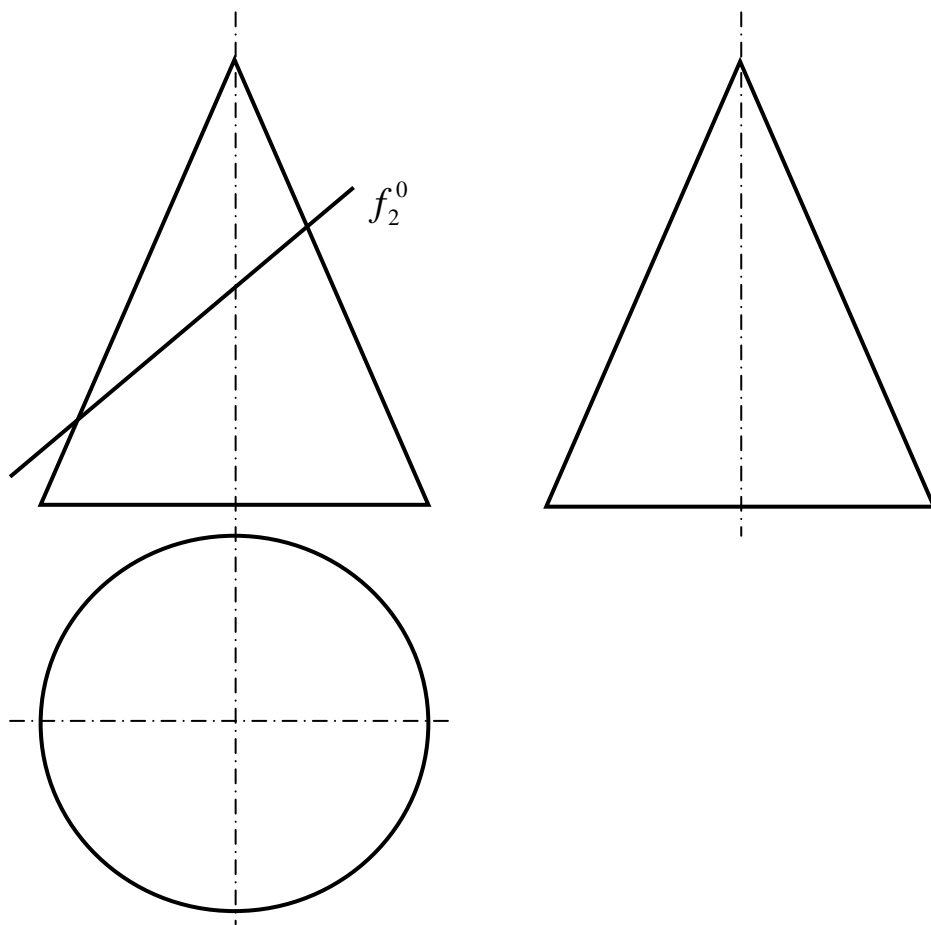
2)



3)

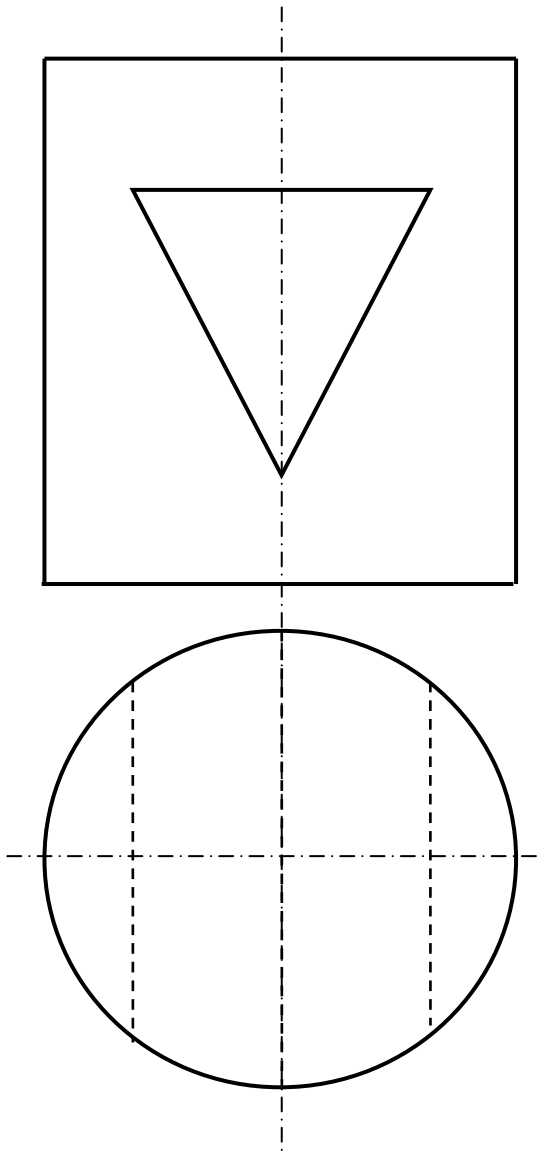


4)



### Task 5.3

Construct three projections and find the true size of the section.





## HOMETASK

Construct a four Solids on the two Formats A3 . Use all parameters from Table 15, 16. On each geometrical solid a student gets a section plane, construct projection of section and its true size. The example of the task 4 and 5 « **SOLIDS** » is presented in Annex 4.

**Table 15**

Variant	Prism		Pyramid		Cylinder		Cone		Variant	Prism		Pyramid		Cylinder		Cone	
	D	H	D	H	D	H	D	H		D	H	D	H	D	H	D	H
<b>1</b>	90	100	95	115	80	105	80	115	<b>21</b>	95	115	90	100	80	115	80	105
<b>2</b>	95	115	90	110	80	95	90	110	<b>22</b>	90	110	95	115	90	110	80	95
<b>3</b>	80	100	70	105	85	100	90	105	<b>23</b>	70	105	80	100	90	105	85	100
<b>4</b>	85	110	75	115	70	110	90	115	<b>24</b>	75	115	85	110	90	115	70	110
<b>5</b>	90	100	95	85	85	105	95	85	<b>25</b>	95	85	90	100	95	85	85	105
<b>6</b>	95	115	90	95	85	90	95	95	<b>26</b>	90	95	95	115	95	95	85	90
<b>7</b>	75	95	75	95	75	100	80	95	<b>27</b>	75	95	75	95	80	95	75	100
<b>8</b>	80	95	80	95	75	105	90	95	<b>28</b>	80	95	80	95	90	95	75	105
<b>9</b>	90	105	90	85	80	90	95	85	<b>29</b>	90	85	90	105	95	85	80	90
<b>10</b>	80	90	60	85	75	110	90	85	<b>30</b>	60	85	80	90	90	85	75	110
<b>11</b>	95	100	65	85	85	96	90	85	<b>31</b>	65	85	95	100	90	85	85	96
<b>12</b>	85	105	60	85	80	80	85	85	<b>32</b>	60	85	85	105	85	85	80	80
<b>13</b>	90	90	60	95	80	90	90	95	<b>33</b>	60	95	90	90	90	95	80	90
<b>14</b>	85	110	60	90	90	100	90	90	<b>34</b>	60	90	85	110	90	90	90	100
<b>15</b>	90	115	60	95	80	115	75	95	<b>35</b>	60	95	90	115	75	95	80	115
<b>16</b>	95	115	55	80	60	95	60	80	<b>36</b>	55	80	95	115	60	80	60	95
<b>17</b>	80	100	55	80	60	95	65	80	<b>37</b>	55	80	80	100	65	80	60	95
<b>18</b>	75	95	60	85	55	80	55	85	<b>38</b>	60	85	75	95	55	85	55	80
<b>19</b>	80	95	60	80	55	80	65	80	<b>39</b>	60	80	80	95	65	80	55	80
<b>20</b>	95	100	95	115	60	85	55	115	<b>40</b>	95	115	95	100	55	115	60	85

Table 16

1.6.11.16.21.26.31.36	2.7.12.17.22.27.32.37	3.8.13.18.23.28.33.38	4.9.14.19.24.29.34.39
5.10.15.20.25.30.35.40	1.6.11.16.21.26.31.36	2.7.12.17.22.27.32.37	3.8.13.18.23.28.33.38
4.9.14.19.24.29.34.39	5.10.15.20.25.30.35.40	1-40	1-40

## AXONOMETRIC PROJECTION

### 6.1 REGULAR ISOMETRIC

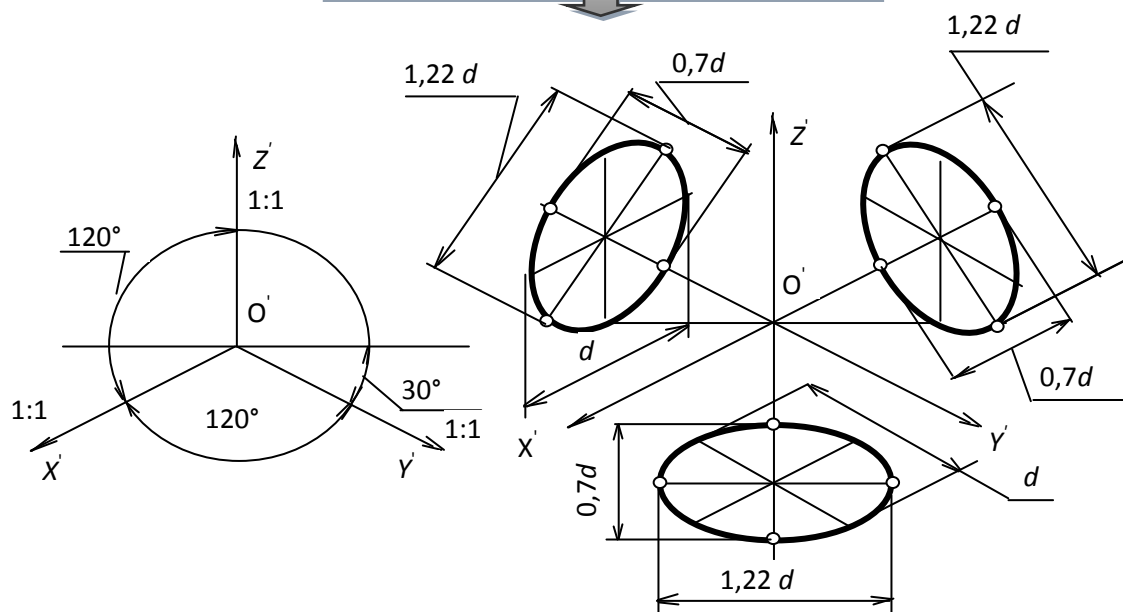
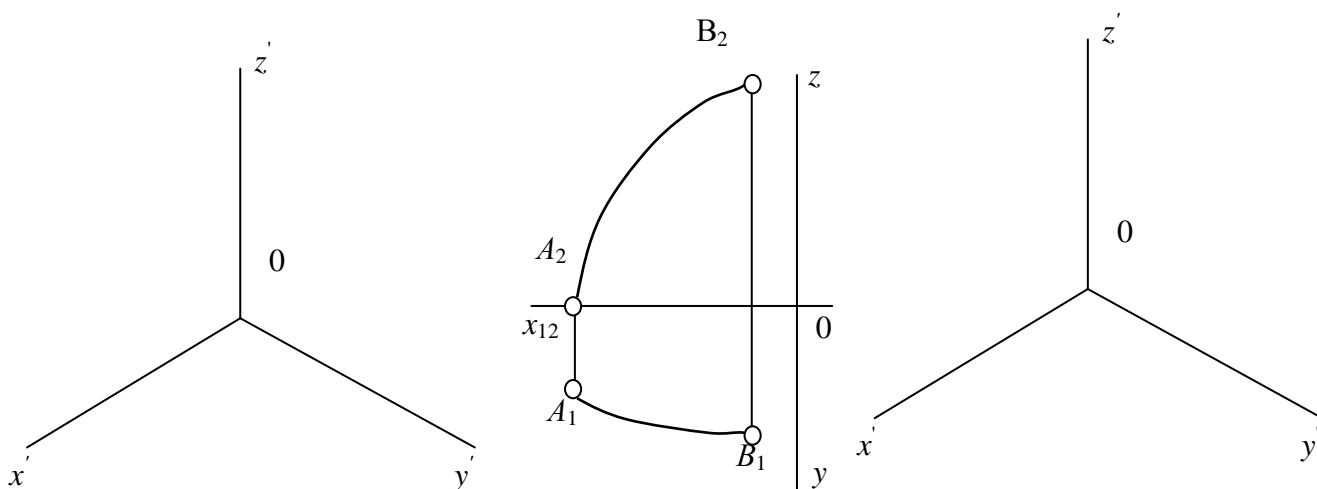


Fig. 6.1. Rectangular isometric

#### Problem 6.1

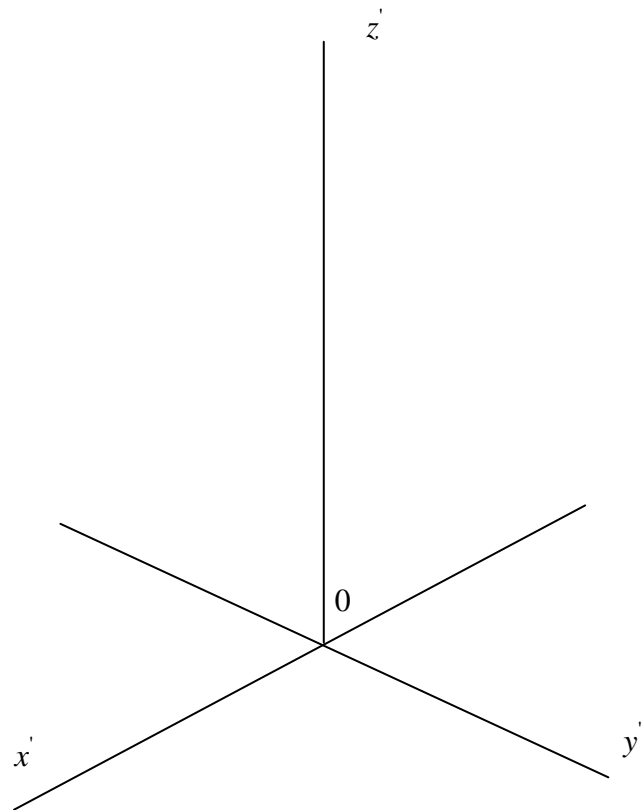
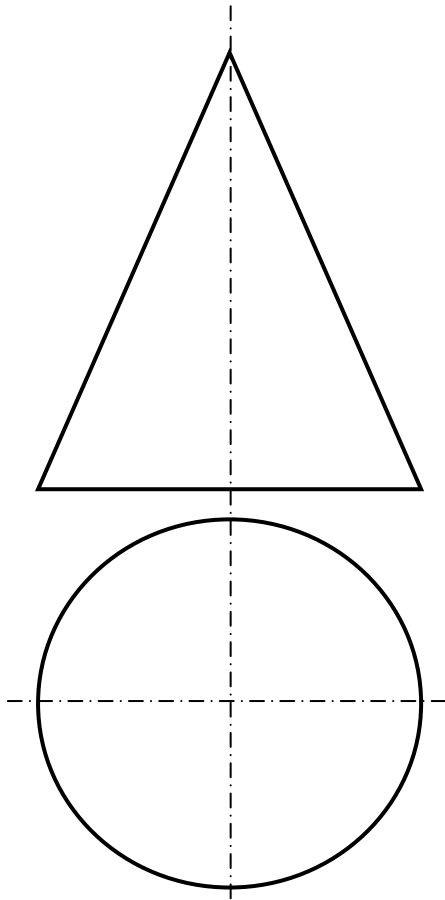
Construct regular isometric projections of the point  $C (20, 10, 30)$  and the curve  $AB$ .



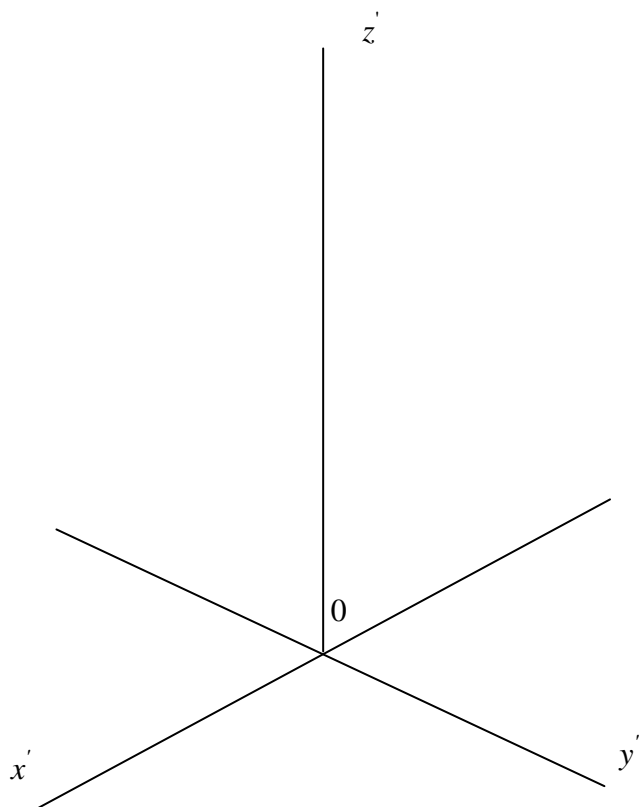
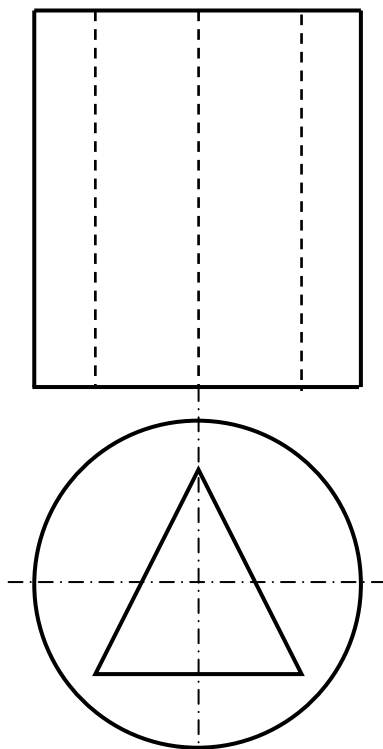
# Problem 6.2

Construct a regular isometrics of the cone and the cylinder with the  $\frac{1}{4}$  of.

1)



2)



## 6.2 RIGHTANGULAR DIMETRIC

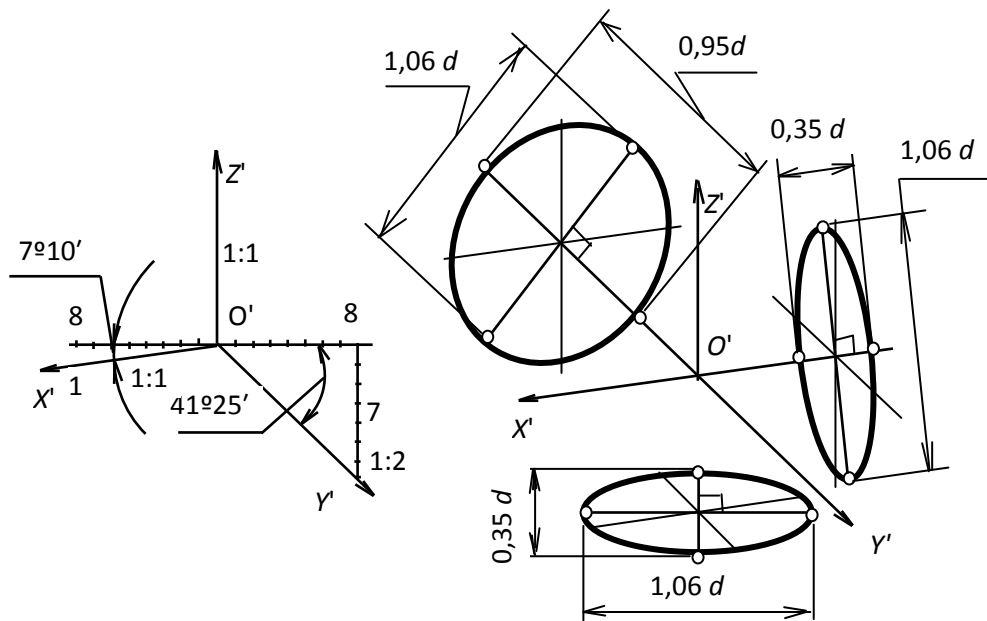
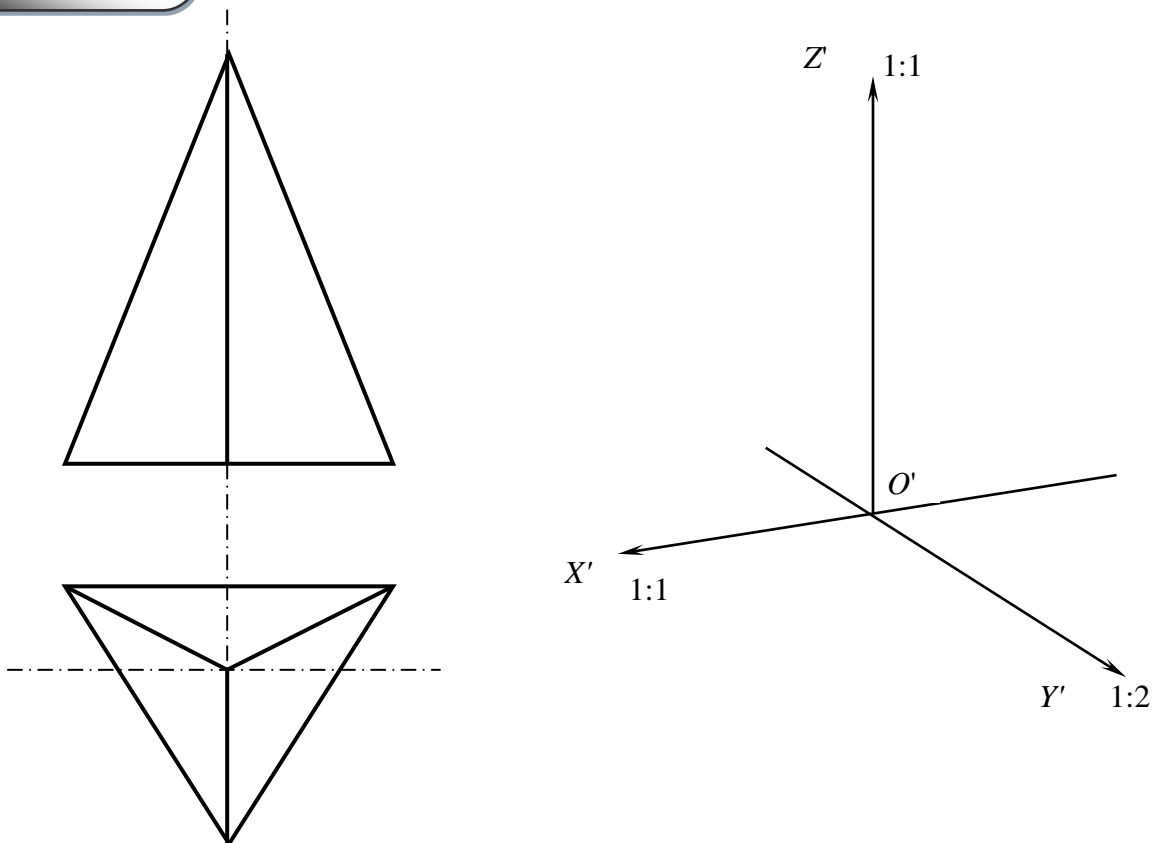


Fig. 5.2. Rectangular dimetric

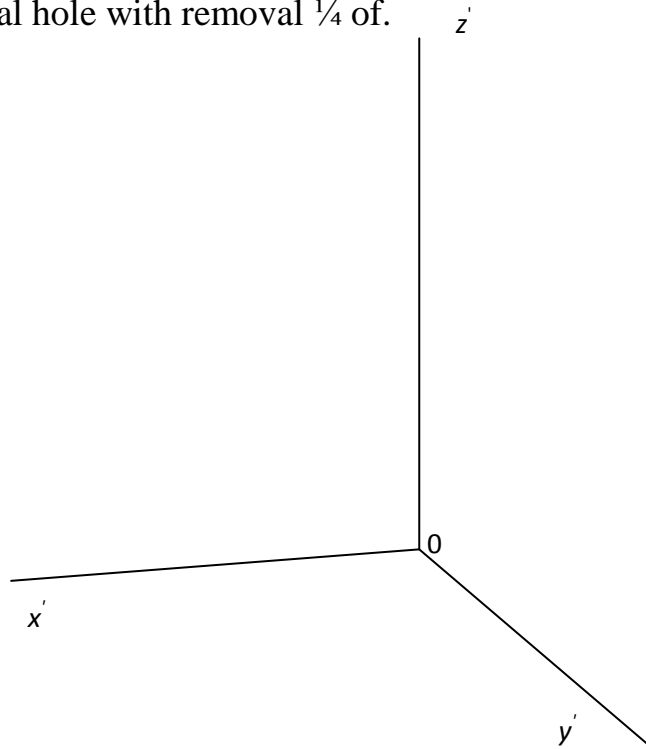
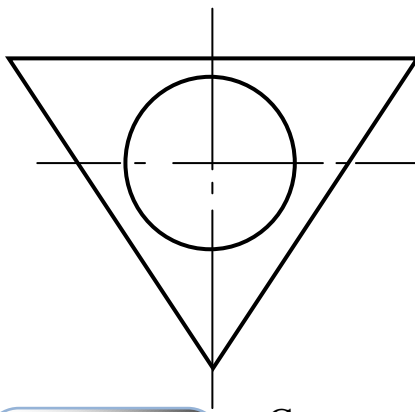
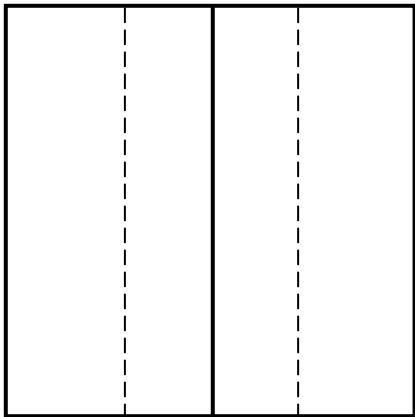
### Problem 6.3

Construct rectangular dimetric projection of the pyramid with the  $\frac{1}{4}$  of.



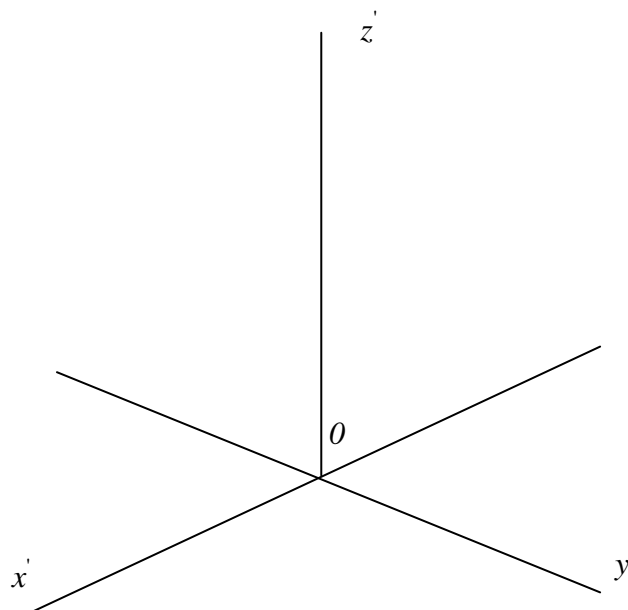
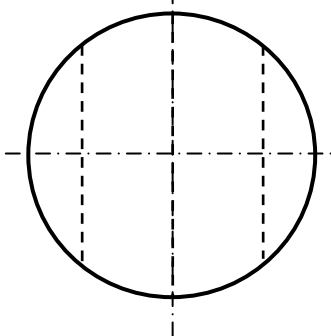
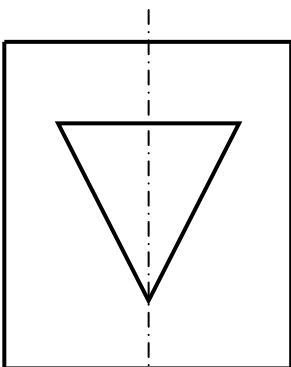
### Problem 6.4

Construct a rectangular dimetric projection of the prism with a through cylindrical hole with removal  $\frac{1}{4}$  of.



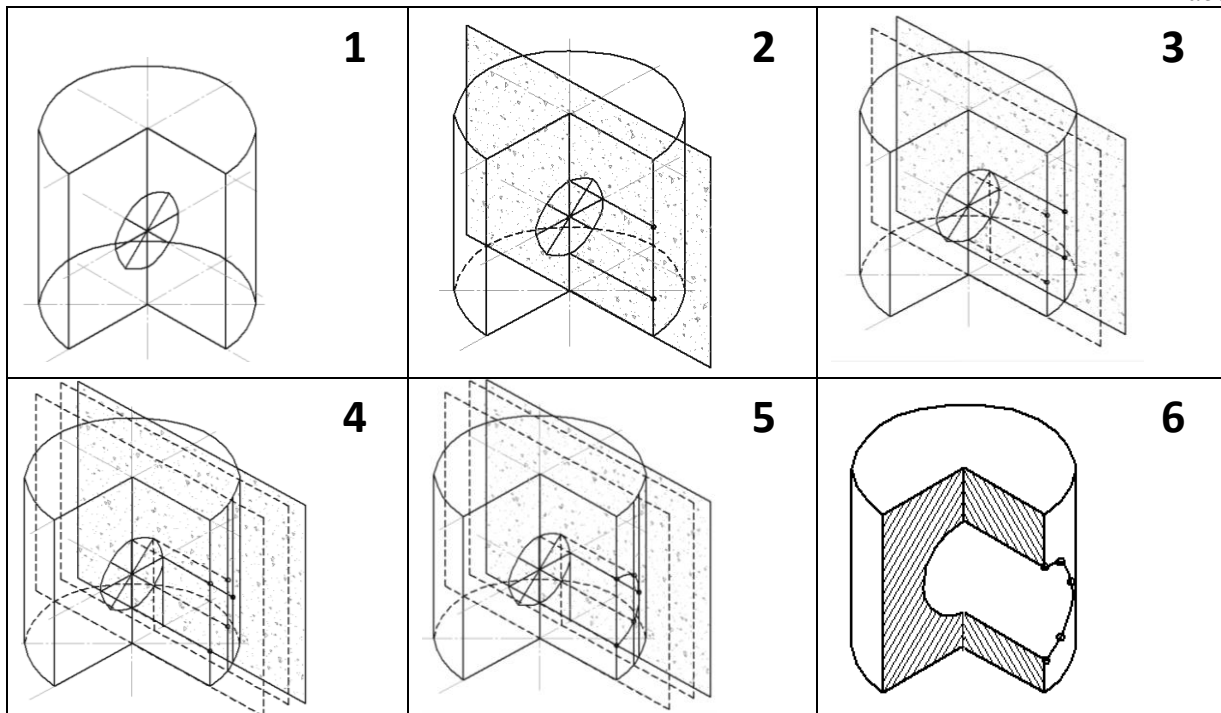
### Problem 6.5

Construct a rightangular isometric projection of a cylinder with through prismatic hole, using method of cutting planes (Table 17, 18).



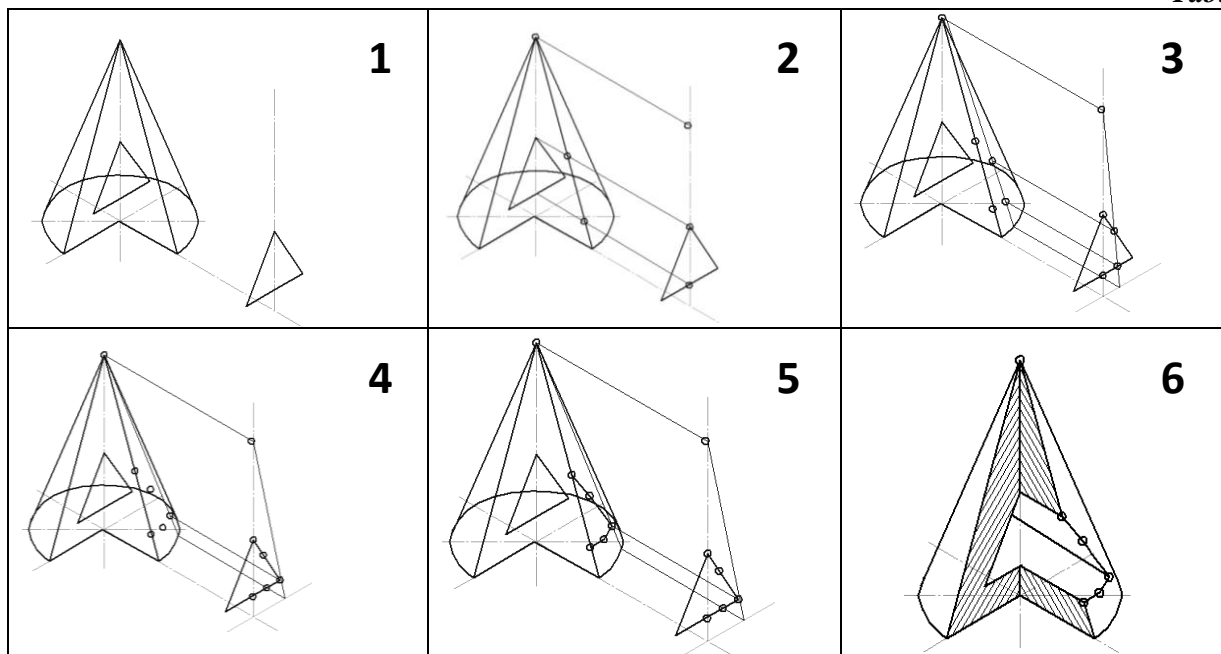
***Axonometric of the cylinder with a cylindrical hole with the method of cutting planes.  
Succession of constructions.***

**Table 17**



***Constructions axonometric of the cone with prismatic hole by the method of cutting planes***

**Table 18**



**HOMETASK**

Construct an Axonometric of the Solid on the Formats A4. Use all parameters from Table 15, 16. The example of the task 6 «AXONOMETRIC DRAWING» is presented in Annex 5.

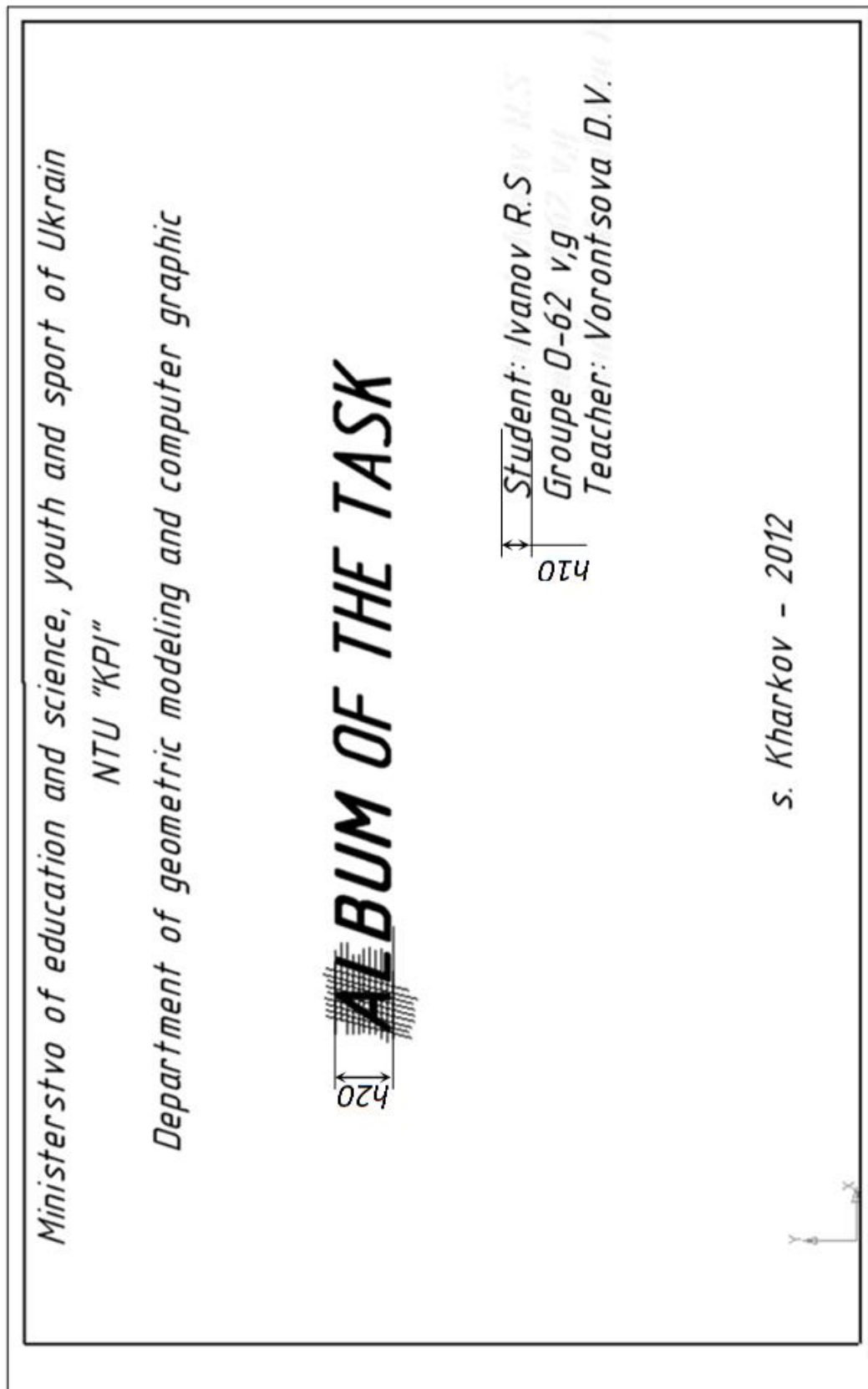


<i>Answers to the test questions</i>									
<i>№</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>
<i>Answers</i>	<i>I</i>	<i>8</i>	<i>Π<sub>3</sub></i> <i>Π<sub>1</sub></i>	<i>BC,GH</i>			<i>M</i>	$\Sigma$	$\Delta$ <i>CDE</i>

## ANNEXES

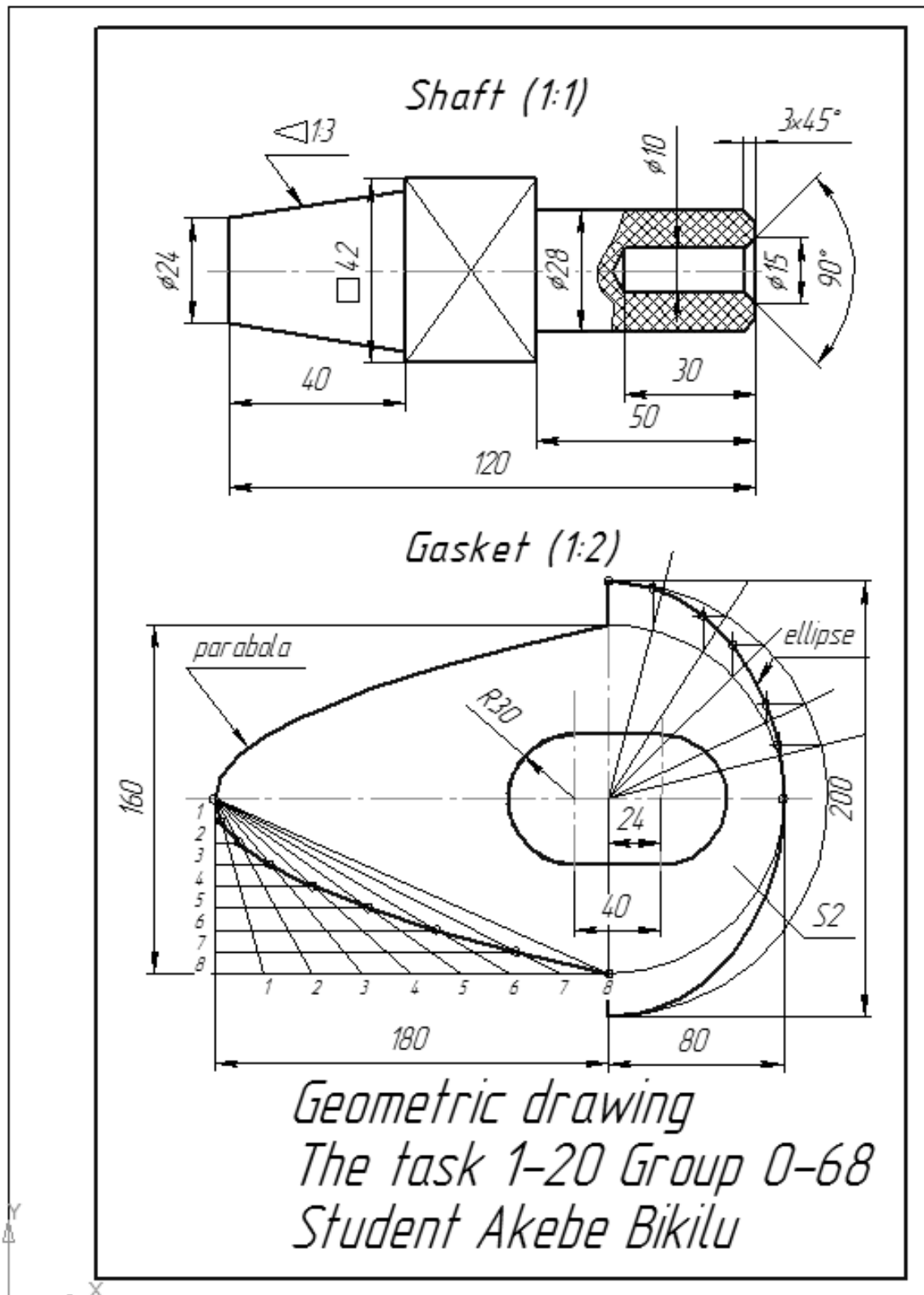
### ANNEX 1

The sample of the title page.



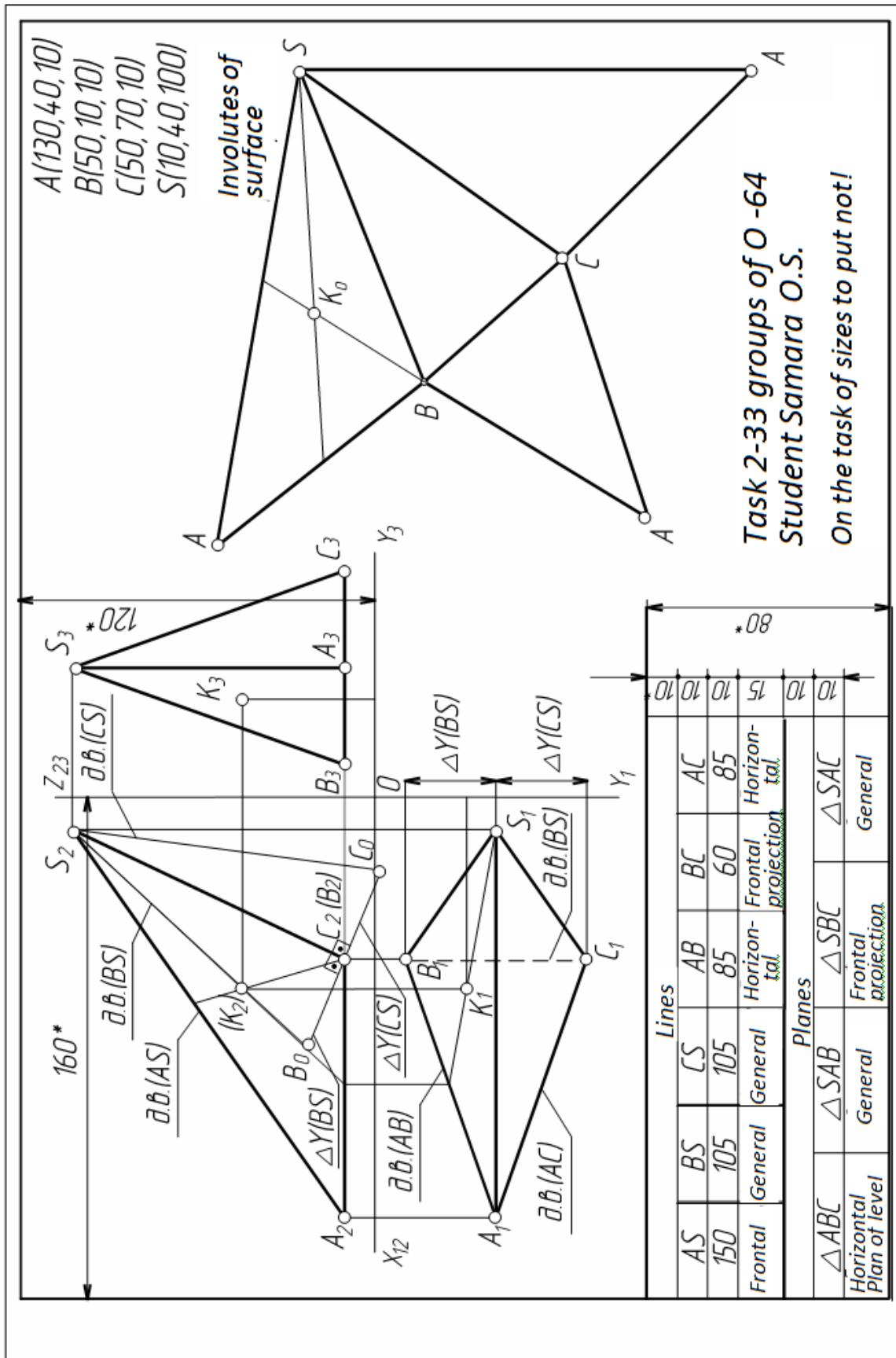
## ANNEX 2

The Example of the Shaft and The Gasket.

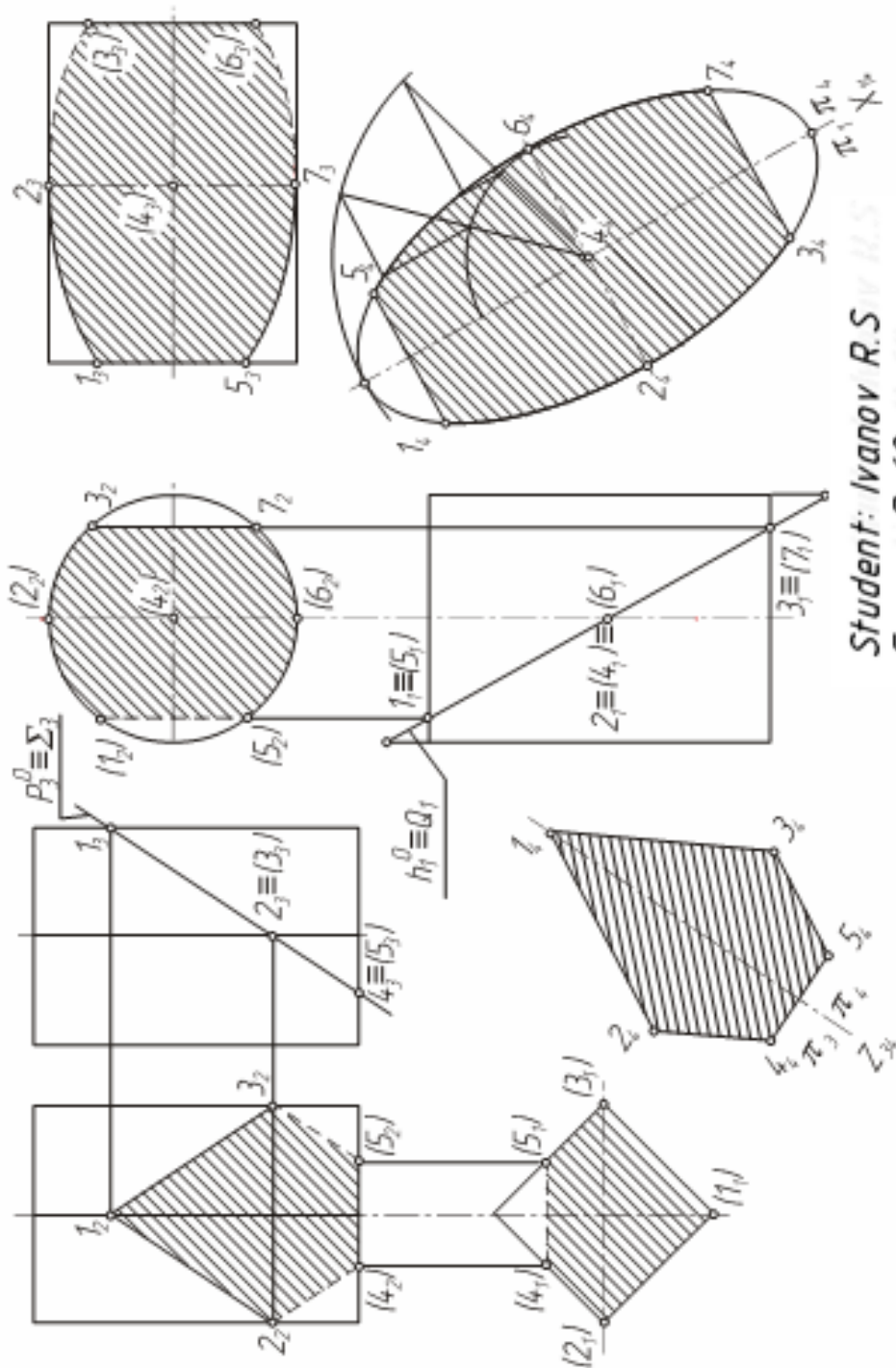


# ANNEX 3

The example of Task 2 «Point, straight line, plane»

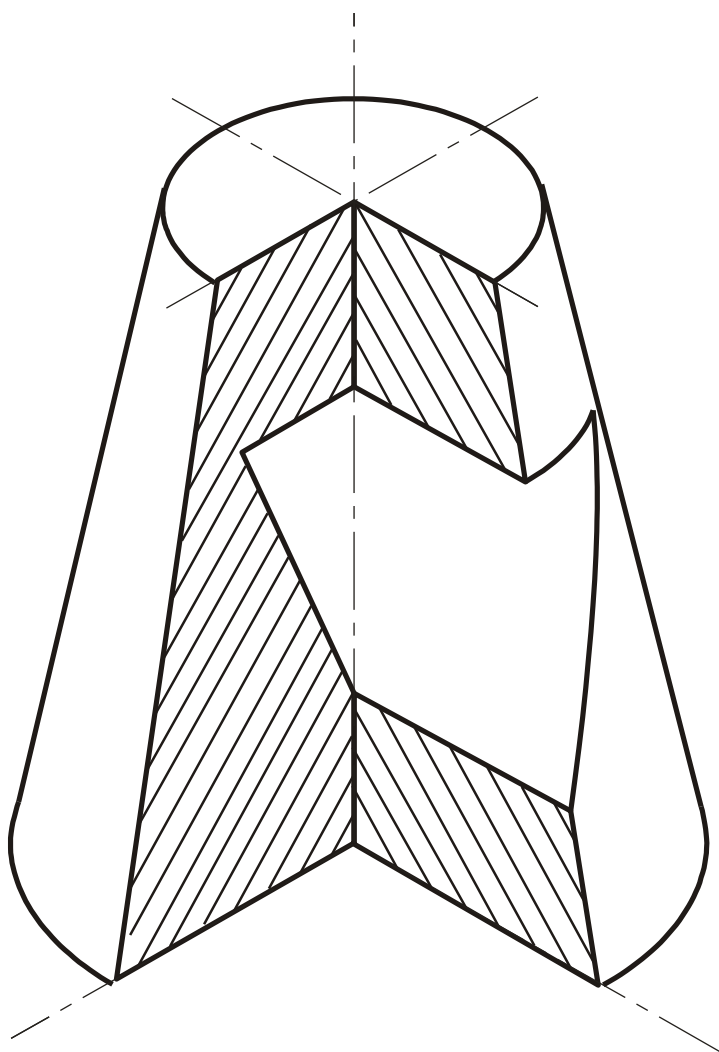


ANNEX 4  
Solid and Sections



Student: Ivanov R.S.  
Groupe D-62 v.g  
Teacher: Vorontsova D.V.

Axonometric drawings



*Student: Ivanov R.S*  
*Groupe D-62 v,g*  
*Teacher: Vorontsova D.V.*

## LITERATURE

1. Gordon V. The course of descriptive geometry / V. Gordon. – M., 1988.
2. Descriptive geometry: a textbook / V. E. Mikhaylenko, M. F. Yevstyfyeyev, S. M. Kovalev. – K., 1993.
3. Kirichenko A. F. Theoretical Foundations of engineering drawing: a textbook for higher technical education / A. F. Kirichenko. – K.: Professional, 2004. – 496 p.
4. Krasnokutskiy A. M. Theoretical Fundamentals of building tehnycheskyh Drawings / A. M. Krasnokutskyy, V.V. Zherezhon - Zaychenko – H.: NTU "**KPI**", 2003. –106p.

Навчальне видання

## ENGINEERING GRAPHICS

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